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SECTION OF BIOLOGICAL AND MEDICAL SCIENCES

THE APPLICATION AND DEVELOPMENT PROSPECTS OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN PHARMACEUTICAL SCIENCE

Bandaliyeva A.
PhD
Azerbaijan Medical University,
Department of Pharmaceutical Technology and Management, Senior Lecturer
Yusifova J.
DSc
Azerbaijan Medical University,
Department of Pharmaceutical Chemistry, Professor
Huseynova A.
PhD
Azerbaijan Medical University,
Department of Pharmaceutical Technology and Management, Senior Lecturer
Mammadli A.
Azerbaijan Medical University,
Department of Nutrition and Medical Ecology, Senior Laboratory Assistant
DOI: 10.5281/zenodo.18655844

Abstract

In recent years, artificial intelligence (AI) technologies have become one of the most innovative and influential tools in the development of pharmaceutical science. The increasing complexity of drug discovery, production, and personalized therapy has made the integration of AI systems both necessary and highly relevant. Artificial intelligence enables the acceleration of drug development processes, optimization of clinical trials, improvement of manufacturing quality control, and enhancement of individualized treatment strategies. This article examines the role of artificial intelligence and robotic technologies in pharmaceutical science, analyzes their main application areas, evaluates their advantages and potential risks, and discusses future development perspectives. The findings indicate that the controlled and ethical implementation of AI will significantly contribute to improving pharmaceutical services and healthcare outcomes.

Keywords: Pharmaceutical science, artificial intelligence, robotic technologies.

Artificial intelligence technologies have become an integral part of modern healthcare and pharmaceutical science due to rapid scientific and technological progress. The growing prevalence of chronic diseases, the increasing demand for personalized medicine, and the complexity of developing new pharmaceutical products have significantly increased the relevance of artificial intelligence-based approaches. In pharmaceutical science, artificial intelligence plays a crucial role in reducing time, cost, and human-related risks associated with drug discovery, clinical trials, and manufacturing processes [1,2]. Therefore, studying the scientific foundations of artificial intelligence applications in pharmacy and evaluating their future development prospects is of great importance [3].

The study was conducted through the analysis of international scientific publications, modern biomedical technologies, analytical reports, and statistical data related to the application of artificial intelligence and robotic systems in pharmaceutical practice. Comparative evaluation of international experience was carried out, and the role of artificial intelligence-based algorithms in drug development and production was systematically assessed [4,5].

Artificial intelligence technologies are widely used in pharmaceutical science for the discovery and design of new drugs. AI systems are capable of modeling the mechanisms of action of pharmaceutical substances at the molecular level, enabling the rapid identification of promising compounds. Machine learning algorithms analyze thousands of chemical structures to identify effective drug candidates for diseases such as cancer, diabetes, and Alzheimer's disease [6,7]. In addition, artificial intelligence significantly optimizes clinical trials by improving patient selection, predicting potential risks, and reducing trial failure rates, which leads to substantial savings in both time and financial resources [8].

Robotic technologies and AI-based systems are actively used in pharmaceutical manufacturing to analyze raw materials, ensure compliance with quality standards, and detect defects in real time. These technologies improve production accuracy and minimize human error, thereby enhancing the overall quality and safety of pharmaceutical products [9]. Furthermore, artificial intelligence enables personalized therapy by determining optimal drug dosages and treatment regimens based on patients' genetic, biochemical, and clinical characteristics. This personalized approach increases therapeutic effectiveness and reduces adverse drug reactions [10].

Artificial intelligence also plays a vital role in pharmaceutical logistics and distribution systems.

Smart technologies and robotic systems ensure the proper storage, transportation, and timely delivery of medicines, particularly those requiring cold-chain conditions [11]. At the same time, AI-driven market analysis tools evaluate drug efficacy, patient feedback, and market trends, supporting strategic decision-making in pharmaceutical marketing and management.

Despite the numerous advantages of artificial intelligence, its application in pharmaceutical science is associated with certain risks, including data security issues, ethical concerns, and reduced human oversight. For this reason, the implementation of artificial intelligence systems must be accompanied by well-defined legal, ethical, and regulatory frameworks [12,13].

The analysis demonstrates that artificial intelligence and robotic technologies have led to significant advancements in pharmaceutical science. These technologies contribute to faster drug development, improved quality control, optimized dosage determination, and enhanced personalization of treatment. As a result, pharmaceutical services become more efficient, safer, and patient-oriented [14]. In the near future, it is expected that artificial intelligence support in pharmaceutical practice will continue to increase. Routine technical processes will be largely automated, while pharmacists will increasingly assume advisory and clinical roles. The hybrid model combining pharmacists and artificial intelligence technologies is anticipated to become more widespread [15].

In conclusion, artificial intelligence technologies represent one of the most important directions in the future development of pharmaceutical science. Their appropriate and regulated application will contribute to the creation of innovative medicines, improvement of drug safety, and enhancement of overall healthcare efficiency. The results of this study confirm that artificial intelligence will play a decisive role in shaping the future of pharmaceutical science and practice.

References

1. World Health Organization. Artificial Intelligence in Health. WHO Press, 2021, pp. 15–38.

2. Topol E. Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again. Basic Books, 2019, pp. 45–92.

3. Yu KH, Beam AL, Kohane IS. Artificial intelligence in healthcare. Nat Biomed Eng. 2018;2:719–731.

4. Ginsberg J. AI and drug discovery. Drug Discov Today. 2020;25(6):1028–1035.

5. Mak KK, Pichika MR. Artificial intelligence in drug development. Drug Discov Today. 2019;24(3):773–780.

6. Brown N. Chemoinformatics and AI. J Chem Inf Model. 2018;58:155–165.

7. Schneider G. Automating drug discovery. Nat Rev Drug Discov. 2018;17:97–113.

8. Harrer S et al. Artificial intelligence for clinical trial design. Trends Pharmacol Sci. 2019;40(8):577–591.

9. Paul D et al. Smart manufacturing in pharma. Pharmaceutics. 2021;13:1446.

10. Collins FS, Varmus H. Precision medicine. N Engl J Med. 2015;372:793–795.

11. Kelle P et al. Pharmaceutical supply chains. Int J Prod Econ. 2018;204:99–112.

12. Mittelstadt BD et al. Ethics of AI in healthcare. Lancet Digit Health. 2019;1:e18–e27.

13. Price WN. Regulating AI in medicine. Columbia Law Rev. 2019;119:421–480.

14. Davenport T, Kalakota R. The potential of AI in healthcare. Future Healthc J. 2019;6(2):94–98.

15. European Medicines Agency. AI in medicines regulation. EMA Report, 2022, pp. 10–34.

ROLE OF HLA-ALLELES MAJOR HISTOCOMPATIBILITY COMPLEX AND MULTIPLE MYELOMA CLINIC, DIAGNOSIS, TREATMENT

Baratova D.
Eurasian Center of Oncohematology, Immunology and Therapy, Saint-Petersburg, Russia
National register of hematopoietic stem cells *Kirghizia, Saint-Petersburg, Russia*
Baratova M.
*N*ational scientific center oncology and transplantology *Astana, Kazakhstan*
National register of hematopoietic stem cells *Kirghizia, Saint-Petersburg, Russia*
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Abstract

The article presents the results of retrospective and prospective studies of immunogenetic characteristics of the major histocompatibility complex (MHC), typed for the first time according to the human leukocyte antigens (HLA) tissue compatibility system - alleles of the I class of loci (A and B)* and II class of the locus DRB1*of patients with multiple myeloma (MM) of the indigenous people, inhabitants residents of the Kyrgyz Republic (Kirghizia). A comparative assessment of the incidence of HLA-antigens among patients with multiple myeloma of kirghiz nationality and patients with multiple myeloma of the Russian-speaking population (mixed nation and different nationalities) of the indigenous inhabitants of the Kyrgyz Republic (Kirghizia) was carried out, while there are quite highly reliable significant differences. The most common antigens are HLA-A10, HLA-A25, HLA-A28, HLA-B10, HLA-B13, HLA-B14, HLA-B17, HLA-B40, HLA-B58 and HLA-DRB1*02, HLA-DRB1*09, HLA-DRB1*14, HLA-DRB1*16 among patients multiple myeloma kirghiz nationality. In patients with identified antigens HLA-A10, HLA-A25, HLA-B13, HLA-B17and и HLA-DRB1*04, HLA-DRB1*11, HLA-DRB1*14, HLA-DRB1*16, the clinical picture proceeds with an aggressive course of the disease and a high risk of progression. When using a high-tech treatment method, take into account the identified significant HLA-markers in patients with multiple myeloma of kirghiz nationality.

Thus, the major histocompatibility complex of HLA-alleles in the body's immune system plays a huge role, and it is important to search for immunological, immunogenetic criteria for predisposition to diseases, study and timely diagnosis of immune protection factors in a patient, in particular mucosal immunity leading to severe inflammatory diseases, complications with damage to organs and systems, development of a secondary immunodeficiency state.

An early study will identify the impact of imperceptibly, gradually external and internal factors that subsequently affect the process of occurrence, development, course, treatment and prognosis of the disease.

Keywords: human leukocyte antigens(HLA), patients, multiple myeloma.

INTRODUCTION:

Multiple myeloma (MM) - is a chronic clonal-malignant, B-cell-lymphoproliferative disease of the blood system, that occurs at the level of cells of the germinal center of the lymph nodes, without damage to the lymph nodes, the main morphological substrate, which is plasma cells to some extent of maturity and capable of producing structurally homogeneous monoclonal immunoglobulins and free lungs (κ,λ) of the chains[2].

In the research work, the authors [10;11;9] noted, that the major histocompatibility complex (MHC) takes an active part in a number of biological phenomena and consider the types of reactions involving the genes of this complex, reactions to antigens of allotransplantation genesis and genetic control of the immune response.

The groups of researchers [12], described that for the first time the author Dosse J. characterized the function belonging to I class antigens. The major histocompatibility complex determines the interaction not only between immunocompetent cells, but also any cells of the body, ensuring its functional integrity. The participation of T-lymphocyte antigens simultaneously with the recognition of a foreign protein, the organism recognizes its own by antigens of the major histocompatibility complex (MHC).

The study of the function of genes HLA-II class began by the authors Bach F.,et al.,1972[1] and the important function of II class antigens in recognizing their own in the body occurs only when the cells of the immune system interact.

When studying the immunogenetic characteristics of the antigens of the MHC of HLA-alleles in patients with multiple myeloma living in different geographical areas, rather significant differences were revealed [4].

At the clinical-diagnostic, laboratory- immunogenetic parameters with a variety and extreme variability, of antigens according to the system HLA-major histocompatibility complex indicate the possibility of an affordable choice of high-tech typing methods and a differentiated approach in the treatment disease of multiple myeloma.

The purpose of our study was to diagnose and detection in the distribution of antigens in the system HLA-alleles major histocompatibility complex and an individual approach to treatment in patients with multiple myeloma.

MATERIALS AND METHODS:

The study group included and we conducted a retrospective, prospective study, clinical follow-up from March 1994 to September 2025 to study immunological and population characteristics according to the system HLA-alleles of I class of the loci (A and B)*, HLA-alleles of II class of the locus (DRB1)*- in 45 patients with multiple myeloma, of which 22 patients kirghiz

ethnic nationality (women-7, men-15) and control groups comprised 23 patients (women-8, men-15) multiple myeloma of the Russian-speaking population (different nationalities and mixed nation) indigenous people of the Kyrgyz Republic (Kirghizia). Patients with different stages of the course, immunochemical variants of the disease, are distributed according to a generally accepted classification[8], age varies from 33 to 90 years, observed in the National Hospital of Ministry of Health the Kyrgyz Republic(Kirghizia), attached to the Clinical Hospital of the Office of the President and the Government of the Kyrgyz Republic, Eurasian Center of Oncohematology, Immunology and Therapy. Forty (40) patients with disease multiple myeloma were typed from March 1995 to September 1999 years in the laboratory immunology of Saint-Petersburg Clinical Hospital № 31. From 2006 to September 2025 years – five (5) patients with multiple myeloma were examined and typed in the InterMed, INVITRO laboratories.

Delivery and transportation of tubes with blood tests to the immunology laboratory of St. Petersburg Clinical Hospital number 31 from Bishkek to St. Petersburg (Russian Federation) was transported in mini-refrigerated containers at -10ºC. The study on the HLA-alleles system was conducted with the consent of the patient, contract under consent and on a paid basis.

All patients were consulted by therapists, hematologists and studies were carried out at the National Hospital of the Ministry of Health of the Kyrgyz Republic (Kirghizia), the Eurasian Center Oncohematology, Immunology and Therapy. Clinical observations, analysis of medical histories were carried out and in the studied cohort of patients we diagnosed multiple myeloma based on complaints, anamnesis, clinical and objective data, were taken into account comorbid conditions and diseases, predictors of the disease, changes in the levels of indicators: hemoglobin, erythrocyte sedimentation rate (ESR), total protein and its fraction, creatinine, residual nitrogen, urea, glomerular filtration rate and based on standard small and large criteria:presence of plasma cells in bone marrow punctate more than 10%, M-gradient (pathological monoclonal protein) in blood/or urine, on X-ray shows osteodestructive changes in flat bones from one or more pathological foci, increased immunoglobulins of heavy and free lungs(k,λ) chains [5], as well as according to the simplified and minimally unchanged diagnostic criteria scheme proposed by the International Myeloma Working Group(IMWG) on myeloma study [6].

Typing according to the system HLA-antigens of I class of the loci (A and B)*:

The biomaterial for the study was blood from a vein obtained from patients with multiple myeloma. Determination of HLA-allele antigens of loci (A and B)* phenotype of examined patients with multiple myeloma was carried out serologically using a panel of histotyping anti-leukocyte sera of the Russian Research Institute of Hematology and Transfusiology, which allows to determine 17 antigens of locus A and 27 antigens of locus B. HLA-typing analysis was carried out in a specialized laboratory for detecting and determining the type of HLA antigens located on the cell surface.

Typing according to the system HLA- antigens of II class of the locus DRB1*:

Molecular genetic typing of HLA antigens of the DRB1* locus was carried out by polymerase chain reaction (PCR), the biomaterial for the study was blood from a vein. Sets of domestic primers "from DNA-Technology"(Moscow) were used to distinguish 13 groups of HLA-DRB1* alleles (basic resolution). Genomic DNA was isolated from peripheral blood mononuclear cells (fresh or frozen at -20°C) stabilized with ethylenediaminetetraacetic acid (EDTA) or sodium citrate (final concentration of anticoagulant 0,5%) using the "NPF DNA-Technology" Moscow reagent kit or by immunomagnetic method using "Dynal". All kit amplification steps were carried out on the "TERTSIK" amplifier "DNA-Technology",Moscow). The product obtained during amplification was determined by horizontal electrophoresis in 3, 2% agar gel with ultraviolet imaging L = 320 nm. The specificity of the amplification product was compared to a standard PUC-09 DNA length marker. Genes HLA-DRB1* II class provide a blueprint for making proteins that are present on the surface of certain cells of the immune system. The results of HLA-alleles were obtained by sequencing, carried out to determine genetic damage (breakdowns) in DNA. The process of sequencing DNA molecules carrying genetic c information was used to identify the identification of allelic variants in genes of the HLA system.

Statistical processing of the results obtained included the analysis of standard criteria. X2-squared, was used to assess the validity of differences in the occurrence of certain signs between the control group and the group of patients with multiple myeloma. Determines the value "p" corresponding to the found value. X2-squared, determined by a computer program taking into account one degree of freedom. All mathematical calculations and general statistical analysis of the obtained studies were carried out using a personal computer using a package of applications for spreadsheets-"Microsoft-ExcelM Version 7.0 for Windows 95, Windows 2010, Statistics-5.

RESULTS AND DISCUSSION:

Our research, typing according to the system of HLA- alleles I class of loci (A and B) * and II class locus (DRB1*), were carried out to study and identify the variety of suggested immunogenetic markers with disease multiple myeloma among the group of primary patients of kirghiz nationality in comparison with patients with multiple myeloma of the Russian-speaking population (mixed nation and different nationalities) indigenous people inhabitants of the Kyrgyz Republic (Kirghizia). To establish the diagnosis, at the initial examination of the patient, the start of the study began from targeted standard inexpensive, simple and affordable studies. According to the results of the analyzes, all important evidence-based diagnostic criteria characteristic of multiple myeloma disease were used and for with scientific research purposes to determine the common characteristic genes for a specific population, the connections between certain genotypes, immunoglobulins, antigens characteristic of the aggressive course of

the disease, in terms of studying the development of effective treatment were carried out before complex expensive immunogenetic studies, antigen detection according to the HLA- allele system of the major histocompatibility complex. Immunogenetic data showed, significant differences by frequency of detection of HLA-alleles I class of locus A (Fig. 1), locus B (Fig. 2) and HLA-alleles II class of locus DRB1* (Fig. 3) among patients with disease multiple myeloma.

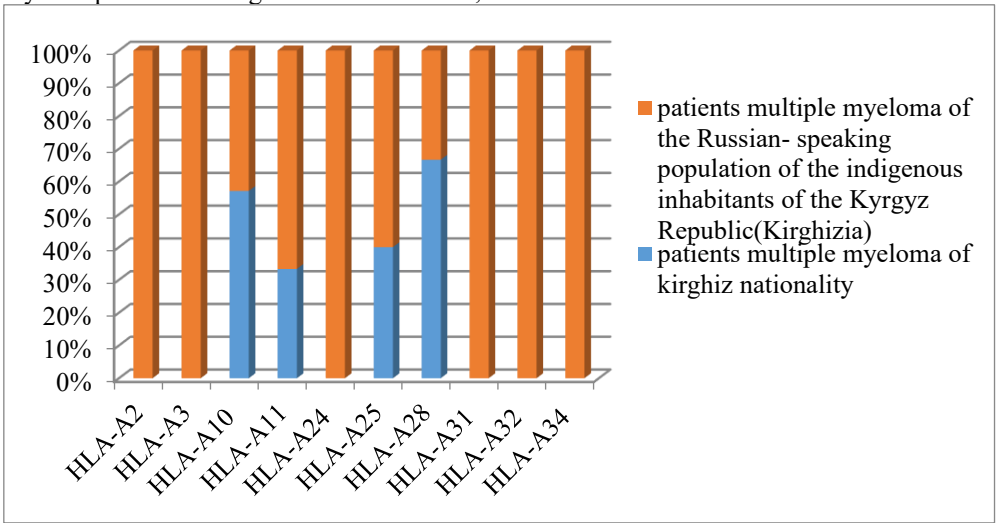

Figure 1.Comparative characteristics of the frequency of HLA-alleles of I class (locus A) among patients with multiple myeloma of kirghiz nationality and the Russian-speaking population of the indigenous inhabitants of the Kyrgyz Republic (Kirghizia).

When comparing the frequence of occurrence, prevalence of antigens according to the HLA- allelic system of I class I (locus A) is shown from the presented Figure 1, that the most common HLA-A2 genes in 100% of cases, HLA-A3 in 100% of cases, HLA-A24 in100% of cases, HLA-A31 in 100% of cases, HLA-A34 in 100% of cases is detected practically among patients with multiple myeloma of the Russian-speaking population of the indigenous people inhabitants of the Kyrgyz Republic (Kirghizia).

Antigens are detected HLA-A10 in 55% of cases, HLA-A11 in 32% of cases, HLA-A25 in 38% of cases, HLA-A28 in 64% of cases among patients with multiple myeloma of kirghiz nationality and antigens HLA-A10 in 45% of cases, HLA-A11in 68% of cases, HLA-A25 in 62% of cases, HLA-A28 in 36% of cases among patients with multiple myeloma of the Russian-speaking population of the Kyrgyz Republic.

In terms of significance of differences, a comparative analysis of the HLA system of allele in locus A in patients with multiple myeloma of kirghiz nationality shows a high frequence of prevalence of HLA-A10 antigens is recorded in 55% of cases, HLA-A28 in 64% of cases. In our observation, in patients with antigens HLA-A10, HLA-A25 the clinical picture of the disease progresses more aggressively. Antigens HLA-A2, HLA-A3, HLA-A24, HLA-A31, HLA-A32,

HLA-A34 are detected in patients with MM of the Russian-speaking population of the indigenous people inhabitants of the Kyrgyz Republic (Kirghizia) and for the kirghiz population these antigens is are rare and have statistically significant differences, where p <0,0001.

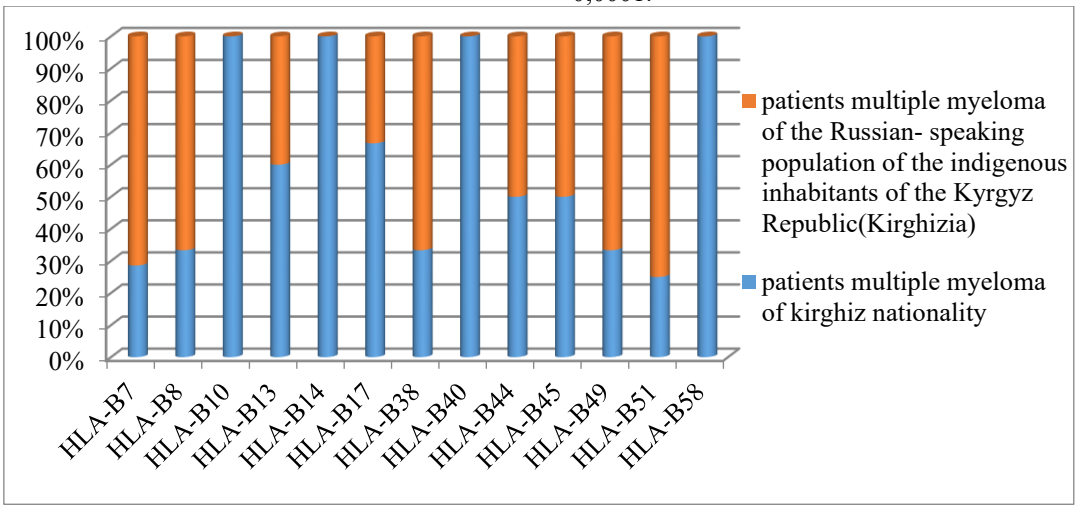

Figure 2. Comparative characteristics of the frequency of detection antigens of HLA-allele I class (locus B) among patients with multiple myeloma of kirghiz nationality and the Russian-speaking population of the indigenous inhabitants of the Kyrgyz Republic(Kirghizia).

When comparing the frequency of occurrence of allele antigens HLA-I class (locus B), as can be seen fromin Figure 2, it is shown that HLA-B7 antigens in 28% of cases, HLA-B8 in 32% of cases, HLA-B10 in 100% of cases, HLA-B13 in 59% of cases, HLA-B14 in 100% of cases, HLA-B17 in 64% of cases, HLA-B38 in 32% of cases, HLA-B40 in 100% of cases, HLA-B44 in 49% of cases, HLA-B45 in 49% of cases, HLA-B49 in 32% of cases HLA-B51 in 23% of cases, HLA-B58 in 100% of cases it is detected among patients with multiple myeloma of kirghiz nationality and antigens HLA-B7 in 72% of cases, HLA-B8 in 68% of cases, HLA-B13 in 41% of cases, HLA-B17 in 36% of cases, HLA-B38 in 68% of cases, HLA-B44 in 51% of cases, HLA-B45 in 51% of cases, HLA-B49 in 68% of cases, HLA-B51 in 77% of cases among patients with multiple myeloma of the Russian-speaking population of the indigenous people inhabitantsof the Kyrgyz Republic (Kirghizia).

According to the significance of the differences, are detection less frequently the antigens allele HLA-B7, HLA-B8, HLA-B38, HLA-B49, HLA-B51and the more common HLA-allele genes of the HLA-B13, HLA-B17, HLA-B44, HLA- B45 among patients kirghiz nationality with multiple myeloma compared to the control group and have statistically significant differences, where $p < 0{,}005$. Antigens of the HLA-B10, HLA-B14, HLA-B40, HLA-B58 alleles for patients with MM of the Russian-speaking population of the indigenous people inhabitants of the Kyrgyz Republic (Kirghizia) are rare and have statistically significant differences, where $p < 0{,}0001$. At the our observation, among patients with multiple myeloma of kirghiz nationality with HLA-B13, HLA-B17 antigens, the clinical picture progresses an aggressive the course of the disease.

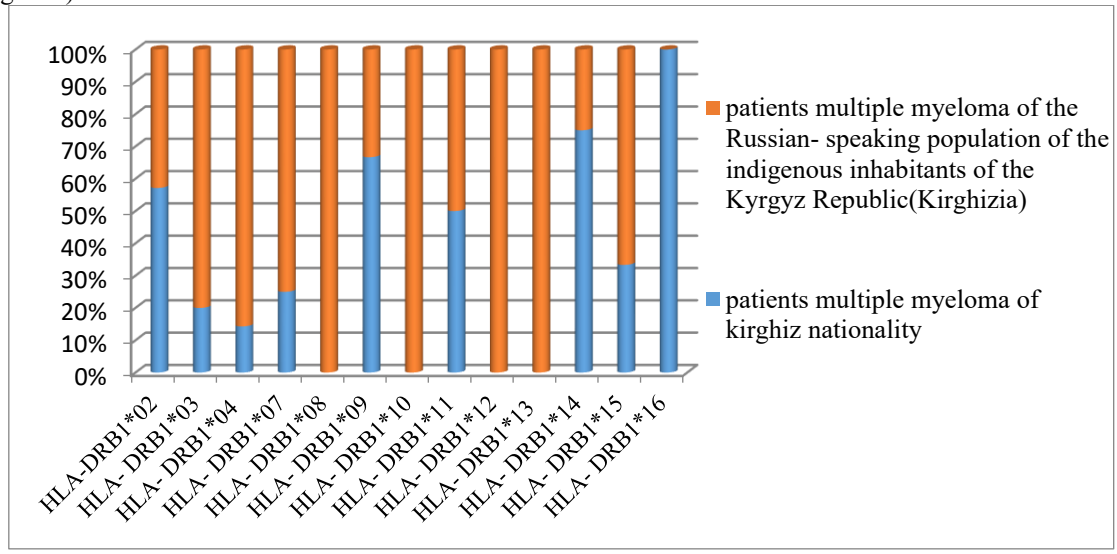

Figure 3. Distribution of HLA -alleles II class of the locus DRB1 among patients with multiple myeloma of kirghiz nationality and Russian-speaking the population of the indigenous inhabitants of the Kyrgyz Republic (Kirghizia).*

As can be seen from Figure 3, according to the distribution of the HLA-alleles II class locus(DRB1*), the HLA-DRB1*02 antigen is detected in patients with multiple myeloma of kirghiz nationality in 55% of cases and among patients with multiple myeloma of the Russian-speaking population of the Kyrgyz Republic (Kirghizia) in 45% of cases.

The antigen HLA-DRB1*03 is detected among patients with multiple myeloma of kirghiz nationality in 18% of cases and in 82% of cases among patients MM of the Russian-speaking population of the Kyrgyz Republic (Kirghizia).

HLA-DRB1*04 antigen is detected in 12% of cases in patients with multiple myeloma of kirghiz nationality and among patients MM of the Russian-speaking population of the Kyrgyz Republic (Kirghizia) in 88% of cases.

HLA-DRB1*07 antigen is detected in 22% of cases in patients with multiple myeloma of kirghiz nationality and in 78% of cases among MM patients of the Russian-speaking population of the Kyrgyz Republic (Kirghizia).

HLA-DRB1*09 antigen is detected in 63% of cases in patients with multiple myeloma of kirghiz nationality and among MM patients of the Russian-speaking population of the Kyrgyz Republic (Kirghizia) in 37% of cases.

HLA-DRB1*11 antigen is detected in 48% of cases in patients with multiple myeloma of kirghiz nationality and in 52% of cases among MM patients of Russian-speaking population of residents of the Kyrgyz Republic (Kirghizia).

HLA-DRB1*14 antigen detected in patients with multiple myeloma of kirghiz nationality in 72% of cases and in patients with MM Russian-speaking population of residents of the Kyrgyz Republic (Kirghizia) in 28% of cases.

Antigen HLA-DRB1*15 is detected in patients with multiple myeloma kirghiz nationality in 31% of cases and among patients with MM Russian-speaking population of residents of the Kyrgyz Republic (Kirghizia) in 69% of cases.

Antigen HLA-DRB1*16 is detected in patients with multiple myeloma kirghiz nationality in 100% of cases and more common antigens HLA-DRB1*08,

HLA-DRB1*10, HLA-DRB1*12, HLA-DRB1*13 in 100% of cases is detected among patients multiple myeloma of the Russian-speaking population of the indigenous people of the Kyrgyz Republic (Kirghizia).

According to the significance of differences, compared with the control group, HLA-alleles II class of locus (DRB1*) antigens are detected: somewhat less often HLA-DRB1*03, HLA-DRB1*04, HLA-DRB1*07, HLA-DRB1*15 and the most common antigens HLA-DRB1*02, HLA-DRB1*09,HLA-DRB1*11, HLA-DRB1* 14, HLA-DRB1*16 among patients with multiple myeloma of kirghiz nationality and have statistically significant differences, where $p<0,005$, $p<0,0001$. At our observation with HLA-DRB1*04, HLA-DRB1*11, HLA-DRB1*14, HLA-DRB1* 16 antigens, the clinical picture proceeds with an aggressive course of the disease among multiple myeloma patients of kirghiz nationality.

Treatment of multiple myeloma- is not a curable disease. Patients with newly diagnosed multiple myeloma received targeted treatment aimed at reducing tumor volume and relieving clinical symptoms. To date, there is standard therapy for the treatment of multiple myeloma, the use in combination of two or three drugs including immunomodulators: thalidomide, lenolidamide, pomalidamide and proteasome inhibitors: bortezomib, oprozomib, carfilzomib, ixazomib, and monoclonal antibodies: elotuzumab, isatuximab, daratuzumab, pembrolizumab. When choosing a therapy, patients with multiple myeloma should be approached differentially and individually.

High-tech therapy autologous hematopoietic stem cell transplantation(AutoSCT) or allogenetic (alloSCT) are carried out strictly according to the indications and at the same time take into account all contraindications for carrying out. When planning and performing autologous haemopoietic stem cell transplantation, a good result can be obtained by perfect induction and maintenance therapy.

For allotransplantation(Allo SCT) haploidentical (brother, sister, parent), closely related, is not closely (unrelated) of bone marrow, it is necessary to have a healthy hematopoietic stem cell donor compatible in all parameters (starting with the blood group test according to the system (ABO), Rh-factor, to immunogenetic indicators and detection, study of concomitant diseases [3;7]. Our most important main purpose- is not to harm nor the donor, nor the patient. According to indications, regardless of age, allotransplantation hematopoietic stem cells can only be performed if there is a compatible healthy donor. But, to today, a healthy compatible donor hematopoietic stem cells is practical very difficult to find.

CONCLUSIONS:

Thus, HLA-antigens play a huge role, taking an active part in both the cellular and humoral factors of immunity, and are involved in all stages of activation of the body's immune system. It is also important to study the factors of immune protection, in particular mucosal immunity, leading to the development of a secondary immunodeficiency state and is important timely treatment to normalize the system of innate immunity. The major histocompatibility complex of the HLA- alleles is one of the complex immunogenetic systems of human nature, it is necessary to timely study and early resolve the issue in the fight against malignant oncohematological and autoimmune diseases.

In the future, during the diagnosis period, in addition to the main diagnostic criteria for multiple myeloma, can hematologists use the assume genes typed according to the system of HLA-alleles of I class loci (AandB)*, HLA-alleles locus DRB1*of II class, as one of the additional criteria for multiple myeloma disease? The list of mandatory studies, typing according to the system HLA-alleles of the major complex histocompatibility for the establish diagnosis of multiple myeloma - not included. Study strictly by indication and individually for genetic information. The results of detection of the identified HLA-alleles antigens, should be taken into account account for further patient administration tactics.

Identified and prevalent antigens HLA-A10, HLA-A28, HLA-B10, HLA-B14, HLA-B40, HLA-B58, HLA-DRB1*02, HLA-DRB1*09, HLA-DRB1*11, HLA-DRB1*14, HLA-DRB1*16 among patients with multiple myeloma kirghiz nationality. In our study, the disease multiple myeloma is less common among the kirghiz population and with retrospective, prospective observation detections with antigens HLA-A10, HLA-A25, HLA-B13, HLA-B17 and HLA-DRB1*04, HLA-DRB1*11, HLA-DRB1*14, HLA-DRB1*16 among patients of kirghiz nationality, more often the clinical picture proceeds with an aggressive course of the disease, and with a high risk of progression.

Important and it is necessary to take into account all the differences in the distribution of HLA-alleles of the major histocompatibility complex, genetic information (genetic breakdowns, pathology) and only strictly according to indications is planning haploidentical (brother, sister, parent), closely related, is not closely related (unrelated) hematopoietic stem cell transplantation in patients with multiple myeloma, as well as in other oncohematological malignant diseases.

In addition to the main targeted treatment, in the future cell therapy, immune therapy (anticancer vaccines with effectiveness in 85-95% of cases) will find its powerful direction in the treatment of multiple myeloma and other oncohematological diseases.

FINDINGS:

1.To study patients with multiple myeloma for antigens according to the system of HLA-alleles of I class of the loci (A and B)* and HLA-alleles of II class of the locus (DRB1)*strictly according to indications.

2. According to indications, when planning to the perform autologous hematopoietic stem cells transplantation or allogenetic(Allo HSCT), patients should start from simple studies, exclude all concomitant pathologies, and only if necessary, conduct expensive immunogenetic studies.

3. To patients with disease multiple myeloma, systematic follow-up by a hematologist and treatment of the underlying disease. Annual and seasonal vaccination against influenza virus.

References

1. Bach F., Widner M., Bach M., Klein J. Serologically defined and lymphocyte defined components of MHC in mouse//Journal Experim. Medicine. – 1972.-№136. – P. 1430.

2. Baratova D.A., Baratova M.A. Comparative characteristics of frequency elicitation and prevalence of the types heavy and content of free easy (k,λ) chains of immunoglobulins among patients with multiple myeloma and potential donors bone marrow//European Journal of Natural History//-2017.−Франция (Париж) – 2017. №– 6; стр. 9-– 14. http://world-science.ru/en/article/view?id=33820 по ссылке http://world-science.ru/pdf/2017/2017_6.pdf

3. Baratova D.A., Baratova M.A. Possibilities of early selection donors of bone marrow non-invasive and invasive methods of diagnostics infection Helicobacter pylori // European Journal of Natural History//– 2015. – № 6; стр. 3-7. доступен по данной ссылке: http://world-science. ru/euro/514

4. Baratova D.A., Baratova M.A. Immunogenetic characteristics of antigens HLA-alleles of the major histocompatibility complex patients with multiple myeloma and donors hematopoetic stem cells//International journal of applied and fundamental research– 2015.–№ 2; URL: http://www.science-sd.com/461-24888 (30.10.2015).

5. Baratova D.A., Baratova M.A. Anemia and Multiple myeloma diagnosis, treatment // "The scientific heritage Hungary//№158. Budapest. 2025. P. 23-32. DOI:10.5281/zenodo.15170203

6. Chng WJ, Dispenzieri A, Chim CS et al. IMWG consensus on risk stratification in multiple myeloma. Leukemia 2014; 28: 269 – 77.

7. Correale P., Mutti L.,Pentimalli F. et al. HLA-B*44 and C*01 Prevalence Correlates with Covid 19 Spreading across Italy. Int. J. Mol. Sci. 2020; 21:5205. DOI: 10.3390/ijms21155205

8. Durie B. G. M., Salmon S. E. A clinical staging system for multiple myeloma: Correlation of measured myeloma cell mass with presenting clinical features. response to treatment, and survival //Cancer. 1975; 36: 842-854.

9. Greenburg A.J., Rajkumar S.V. Elucidating disparities across racial and ethnic groups in multiple myeloma patients. Int J Hematol 2012; 95: 45– 34.

10. Miller S.A., Dykes D.D., Polesky H.F. A simply salting-out procedure for extracting NA from human nucleated cells//Nucleic Acids Res.–1988.–№16.– P.1215.

11. Miller S, Ehninger G., Goldmann S. Gene and haplotyre frequency for the loci HLA-A, HLA-B and HLA-DR based on over 13,000 German Blood Donors //Human Immunology.–2003. Vol. 64. – № 1. P.–137.

12. Sell J., Dosse J., Hetson S. Fabric compatibility.// translates from English: Совместимость тканей: M.–1979.–P.6–500.

PREPAREDNESS OF HOSPITALS FOR MEDICAL PROVISION TO VICTIMS OF RADIOLOGICAL TERRORISM

Hristov N.
MD, PhD,
associate professor,
Tsvetanov P.,
Dimitrov T.,
Zahariev V.
MD, PhD professor, Department of Social Medicine, Preventive Medicine, and Disaster Medicine, Faculty of Public Health,
Medical University of Sofia
DOI: 10.5281/zenodo.18656006

Abstract

Objective: To assess the competence, training and preparedness of hospital personnel in Sofia, to provide medical care to victims of radiological terrorism and radiological accidents.

Design: We performed a cross-sectional survey using three questionnaires. Setting: 10 hospitals for active treatment in Sofia.

Participants: 19 managers, 131 doctors, 152 nurses and laboratory technicians for a total of 302 respondents.

Interventions: None.

Main Outcome Measure: We found good theoretical knowledge among physicians on the necessary medical provision in the first hours after a radiological accident, but we deem it insufficient for an adequate reaction to a large number of casualties in psychological shock, after nuclear contamination.

Results: We found that hospital personnel would not ignore patients and leave them without care in the face of realization that specific competence is lacking.

Conclusions: We found considerable deficits in, or lack thereof theoretical and practical training in dealing with victims of radiological terrorism both among nurses and laboratory technicians, and physicians, which underlines the need for offering such training.

Keywords: radiological terrorism, hospitals, preparedness.

Introduction

In the event of radiological terrorism act the health system and in particular emergency care and hospitals, should be prepared for the sudden load – providing treatment to victims, despite possible constraints: inadequate resources for the large number of casualties, lack of inexperience among medical personnel, probable fear of servicing such patients, hospitals overloaded with unscathed but frightened patients, fearing radiation and radio-nuclide contamination [1,2,3].

Studies in a number of countries – Canada [4], USA [5], Australia [6] and others provide us with a uniform picture – preparedness globally is quite low. Data from studies and experience from radiological accidents show that providing medical care to victims of radiological accident or nuclear terrorist act has its marked specifics, thus even highly qualified professionals unacquainted to the provision of medical care under time deficit and with limited diagnostic and treatment options, turn incapable of providing adequate care to victims. The process of achieving preparedness requires dedicated training, drills and organized approach to emergency care [7,8].

Materials and methods:

We performed a cross-sectional survey to gather data on the competence, training and preparedness of hospital personnel in Sofia, the capital city of Bulgaria, to provide medical care to victims of radiological terrorism and radiological accidents. Subjects studied were the management and personnel (physicians, nurses and laboratory technicians) of 10 hospitals for active treatment in Sofia. The study involved 19 managers, 131 doctors, 152 nurses and laboratory technicians for a total of 302 respondents.

Instruments used

We developed three questionnaires targeted at three groups: hospital management, doctors, and nurses and laboratory technicians; based on literature review and recommendations of international bodies, but adapted to realities in Bulgaria.

Statistical methods used when processing data: descriptive statistics, Chi-square test, Fisher's exact test, Cramer's V contingence coefficient to test the strength of association between category data. We used SPSS version 16.0 to process data from the study.

Analysis of results and discussion:

Analysis of responses from managers

The survey performed among managers of 10 hospitals for active treatment in Sofia presented a clear picture:

Almost all of the surveyed 19 managers believe that the risk of a radiation accident of any type on the territory of Sofia is real. Roughly half of them (47,4%) estimate this risk as minimal, 21,1% as small, and 31,5% as moderate. None of the respondents considers the risk high. Obtained answers were anticipated in light of the fact Bulgaria is not a prime target for terrorism, so the risk of radiological terrorism on the territory of Sofia is small, but should not be neglected. Bulgaria experienced a (conventional) bombing attack with 42 casualties in 2012, targeting Israeli tourists.

More than half (57.9%) of all managers admit that their hospitals lack an algorithm for action in the event

of multiple victims' scenario – e.g., multiple traumas and burns after biological, chemical or radiological accidents, terrorism or weapons application. In the event of a terrorist act with or without the release of radionuclides and with multiple casualties with combined trauma, most of the studied hospitals will face insurmountable organizational difficulties in medical provision. Hospitals will get overloaded both because of the influx of patients and deficiencies in emergency care, due to the lack of pre-planning [9,10].

More than two thirds (73,7%) of managers report, that they are planning training programs for the medical personnel on reaction in disaster situations, and 26,3% have no such plans.

It is especially important for each hospital for active treatment to have both a plan and personnel reserves to provide care to the priority contingents in disasters – children and pregnant women [11,12]. More than half (57.9%) of managers report having such preparation in place.

Leading researchers consider adverse psychological effects in victims of radiological terrorism, their families and society as a whole, highly likely [13,14,15]. Once it becomes known that terrorists have used a radiological dispersing device, treatment of psychological and behavioral changes in people will become as important as treatment related to direct impairment from radiation [16,17]. When asked about their plans to provide psychological support to victims of radiological accidents or terrorism, most managers (84.2%) admit they have no such plans in place (Table 1).

Table 1.

Distribution of answers on the planned psychological help provision in disasters, including radiation accidents

Is psychological help provision foreseen in disasters, including radiation accidents?	N	%
Yes	3	15,8
No	16	84,2
Total	19	100,0

Analysis of responses from medical personnel – doctors, nurses and laboratory technicians

A question of central importance to our study asked to our respondents from the medical personnel was: "What are the possible health outcomes after a radiological terrorist act?"

We find the answers we obtained alarming, to say the least.

65,6% of all surveyed physicians report that they have at least some theoretical grasp of the consequences of radiation exposure; half of them point to the early effects of radiation exposure (skin burns, acute radiation syndrome) and trauma from the blast, while the other half accentuates on late effects on cell DNA and cancer after a period of latency; but the remaining 34,4% have no idea of the effects on health. More than half (around 60%) of the nurses and laboratory technicians report being unfamiliar with the health effects of radiation exposure. The remaining 40% point out trauma and cancer.

In one of the most probable scenarios of radiological terrorism – activating a "dirty bomb" in the center of a major city – two health effects will prevail – one from the immediate blast, and one from the long-term contamination which will manifest itself after a latent period [18,19]. Consequently, the immediate needs of victims during the first hours of such a scenario, would be related to the effects of the explosion, including the psychological shock among persons not directly affected [20,21]. Affected persons with no serious trauma and emergency care indications should get completely decontaminated first, by undressing and washing the whole body [22,23,24]. Radioactive contamination should be measured, before attempting any further medical examination or treatment. Decision making is complicated in the case of severely wounded patients [25], as the urgency of surgical treatment should be judged against the transfer of radioactive contamination in ambulances, offices and operating rooms. The problem is formulated in the statement of a senior physician working in emergency care in Vienna and experienced with radiation: "The optimal balance of medical diagnostic and therapeutic measures and requirements for radiation protection is always the most desirable" [26]**.** With the significance of this issue in mind, we tasked the doctors participating in the survey with ordering by importance the actions they would undertake in the first hours of a radiological accident, using numbers from 1 to 9, where 1 would designate the first and most important action and 9 the least urgent [27].

Summarizing results, this is what respondents would undertake in the first hours of the incident according to prevailing answers: 1-resuscitation, stabilizing and maintaining vital functions; 2-undressing and washing the whole body; 3-pain management; 4-trauma treatment; 5-burns treatment; 6-subsequent skin lesions treatment; 7-addressing the symptoms of radiation sickness; 8-addressing psychological effects (fear and panic); 9-accelerating the elimination of radionuclides from the body. These results demonstrate the good level of knowledge among Bulgarian physicians.

Another important question we asked was: "How would you estimate the risk to your own health when working with radioactively contaminated patients?" In order to provide a justified answer, the respondents had to first answer the following related questions:

- Do you have at your disposal in the hospital personal protective equipment for working with radioactively contaminated patients?

Almost half (48,1%) of the respondents report having personal protective equipment /listing a protective mask, gloves, lead aprons/, with which to protect exposed bodily surfaces and prevent inhaling radionuclides when taking care of a contaminated patient, and the rest (51,9%) – do not have such equipment at their

disposal or have no knowledge of the hospital having such protective equipment.

With medical nurses and laboratory technicians the situation is worse - 65% are not aware of the necessary protective equipment, the rest 35% declare that they would use protective masks, gloves, glasses, lead aprons, and lead collars, if available. Similar answers, demonstrating low levels of awareness among medical personnel have been obtained in other countries as well.

- Have you ever performed some sort of training on servicing a contaminated patient?

Answers make it clear that a small share (about one third) of all doctors, nurses and laboratory technicians have participated in such training and this happened once, so the probability of what has been learned to be long forgotten is quite real. In a study among American and Japanese medical personnel published in 2017 [28], similar results have been obtained related to the actually performed training modules on radiation exposure – over half (56%) respondents report they have received no training whatsoever, approximately one quarter have participated in one training session, 14,4% - have passed two to four courses, and 3,3% - have attended five or more**.**

This leads us to the conclusion medical personnel needs periodic training in sessions, where hypothetical scenarios are discussed and rehearsed. The study among American and Japanese medical personnel shows that issues with inadequate preparation persist not only in Bulgaria, but globally.

- Do physicians have at their disposal instructions for action in case of a radiological accident?

43,5% of physicians report they have such an instruction, and 56,5% – that they either don't or are not aware of its existence. Concerning this, we think a pocket guide for medical personnel would be a good option. Such guide is available online on the CDC site [29]**.**

Having answered the three preceding questions, respondents were asked to rate their personal risk level when working with contaminated patients.

Practically all (90,8%) of the doctors recognize their personal risk when servicing a contaminated patient, and only 12 (9.2%) believe there is no risk involved. When taking into account whether physicians have attended a training course or not, it turns out that training does not change their perception of personal risk.

Similar to physicians almost all (92.8%) of the medical nurses and laboratory technicians are aware of the risks involved in servicing contaminated patients.

When comparing between responses provided by physicians and nurses (Table 2), it becomes apparent that most doctors (37.4%) rank the risk of servicing contaminated patients as small and in second place (31.3%) – as minimal, whereas most nurses (36.8%) point to a moderate risk followed by small. Only 8.4% of physicians believe the risk to be high, compared to 14.5% of nurses. The difference between the two professional groups is significant. Still, the prevailing opinions among doctors and partially among nurses, coincide with the professional consensus among radiation protection experts and it points to a relatively low risk for medical personnel but only when using proper protective gear (Table 2).

Table 2.

Rating risk when servicing a radioactively contaminated patient by doctors in comparison to nurses and laboratory technicians

Nurses and lab technicians	How would you rate risk when using necessary protective equipment?	N	%
Risk	Minimal	32	21,1
	Small	42	27,6
	Moderate	56	36,8
	High	22	14,5
	Total	152	100,0
Doctors	How would you rate risk when using necessary protective equipment?	N	%
Risk	Minimal	41	31,3
	Small	49	37,4
	Moderate	30	22,9
	High	11	8,4
	Total	131	100,0

It is important to note that it is almost impossible for a patient to be so radioactively contaminated so as to represent a real danger to providers of medical care. A possible exception is a patient with nested inside the body fragments from the initial blast.

It is logical that the perception of individual risk when servicing contaminated patients would influence the desire of medical personnel to provide care in the aftermath of a radiological terrorist act [30]. This desire was also studied as part of our study – medics received the question: "Would you turn up in your hospital if summoned after a radition accident with multiple casualties?"

It is encouraging to see that the majority (84.7%) of doctors in Sofia would indeed turn up, in spite of their insufficient expertise and training.

It also turns out that the expressed readiness is dependent on the availability of personal protection equipment. If they are provided a significant (80%) number of doctors would answer the call, but if they are

not provided, more than half (60%) – would not respond. Here, if we divide doctors in two groups again according to whether they received any prior training, those who have already received training would respond a lot more (95.7%) in comparison to those with no prior training (78.8%).

Responses from nurses and laboratory technicians are similar: 80.3% of them would appear for work in such emergency situations. Again, the availability of personal protection and received training increase their desire to contribute. If personal protection was available most (82.3%) would turn up, and if not, only about half of them (49.5%). Almost all (91.9%) with previous training would respond, but for those with no training the share is significantly smaller – 70%.

The real danger of radiological terrorism both globally and in our country, necessitate raising the preparedness level of hospitals to provide medical care to potential victims [31,32,33,34,35,36]. This equates a well-rehearsed individual hospitals action plans for reaction in disasters with multiple casualties, coupled with psychological support plans [37,38,39,40].

Conclusions:

- we found considerable deficits in, or lack thereof theoretical and practical training in dealing with victims of radiological terrorism both among nurses and laboratory technicians, and physicians, which underlines the need for offering such training.
- we found good theoretical knowledge among physicians on the necessary medical provision in the first hours after a radiological accident, but we deem it insufficient for an adequate reaction to a large number of casualties in psychological shock, after nuclear contamination.
- we found that hospital personnel would not ignore patients and leave them without care in the face of realization that specific competence is lacking. It is encouraging to see that the majority of respondents (80.3% of nurses and 84.7% of physicians) would respond to the call of their hospital and participate in medical provision under emergency, in spite of insufficient skills, which underscores the sense of duty of Bulgarian medical personnel.

References

1. Recommendations of the National Council on Radiation Protection and Measurements/NCRP/, USA; Responding to a radiological or nuclear terrorism incident: a guide for decision makers, January 11, 2010, Reprint June 17, 2011; Pages 1-194

2. Vasterling, G.; Management in a Hospital Setting of Persons Contaminated With Radioactive Material and Exposed to Radiation Following a Dirty Bomb Explosion, Missouri Department of Health & Senior Services, Health Guidance, October 2, 2013; Pages 1-7

3. Fereshteh Davari and Arash Zahed; A management plan for hospitals and medical centers facing radiation incidents; J Res Med Sci. 2015 Sep; 20(9): 871–878.; doi: 10.4103/1735- 1995. 170615; Pages 871, 876, 877.

4. Kollek Daniel, Associate Professor of Emergency Medicine, McMaster University, Hamilton, Ontario, Canada, Terrorism in Canada, Published online by Cambridge University Press: 28 June 2012

5. Becker SM, Middleton SA. Improving hospital preparedness for radiological terrorism: perspectives from emergency department physicians and nurses. Disaster Med Public Health Prep 2008; 2(3): 174-84.

6. Mel Taylor, Wendy Joung, Barbara Griffin, David Hill, Robert Chisari, Beryl Hesketh, and Beverley Raphael; The public and a radiological or nuclear emergency event: threat perception, preparedness, and anticipated response. Findings from a preliminary study in Sydney, Australia; The Australian Journal of Emergency Management Volume 26, No. 01, January 2011, Pages 31-39; Page 36

7. Moti Hagby, Avishay Goldberg, Steven Becker, Dagan Schwartz, and Yaron Bar-Dayan; Health implications of radiological terrorism: Perspectives from Israel, J Emerg Trauma Shock. 2009 May-Aug; 2(2): 117–123

8. Clive M. Tan, MBBS, MPH; Daniel J. Barnett, MD, MPH; Adam J. Stolz; Jonathan M. Links, PhD; Radiological Incident Preparedness: Planning at the Local Level; Disaster Med Public Health Preparedness.2011;5: S151-S158

9. Laura Cerezo; Radiation accidents and incidents. What do we know about the medical management of acute radiation syndrome? Rep Pract Oncol Radiother. 2011 Jul; 16(4): 119– 122; Published online 2011 Jul 6. doi: 10.1016/j.rpor.2011.06.002; Science Direct, Elsevier, Page121

10. Robert P. Gale, M.D., Ph.D., and James O. Armitage, M.D; Are We Prepared for Nuclear Terrorism?; March 29, 2018; N Engl J Med 2018; 378:1246-1254;

11. S Chung, M Shannon; Hospital planning for acts of terrorism and other public health emergencies involving children; Arch Dis Child 2005;90:1300–1307; Page 1302

12. CDC (Centers for Desease Control and Prevention, US Department of Health and Human Services, Atlanta, Georgia); Radiation Emergencies and Your Health/ Health Information for Specific Groups

13. I. Khripunov; The social and psychological impact of radiological terrorism, Nonproliferation Review (Journal), 06.2006; Pages 275-316

14. Rajesh M. Basrur, Mumbai, India; Hasan-Askari Rizvi, Lahore, Pakistan; Nuclear Terrorism and South Asia; SAND98-0505/25; February 2003; Page 31(1-80)

15. Alexander DA, Klein S; The challenge of preparation for a chemical, biological, radiological or nuclear terrorist attack; J Postgrad Med April 2006 Vol 52 Issue 2; Pages 126-131

16. S. Biancotto, A. Malizia, M. Pinto, G.M. Contessa, A. Coniglio and M. D'Arienzo Analysis of a dirty bomb attack in a large metropolitan area: simulate the dispersion of radioactive materials; 2020 JINST 15 P02019; Page 15

17. Paul D. Mongan, MD, LTC MC; Cynthia Shields, MD, LTC MC; Darin Via, MD, LCDR MC; Threat of Radiologic Terrorism Increases Unfamiliar

Patient Care and Safety Issues Mandate Preparedness; APSF Newsletter-the official journal of Anesthesia Patient Safety Foundation; 2002.

18. Miquel Macià i Garau, Anna Lucas Calduch and Enric Casanovas López; Radiobiology of the acute radiation syndrome; Rep Pract Oncol Radiother. 2011 Jul; 16(4): 123–130.

19. Steven L. Simon, André Bouville and Charles E. Land; Fallout from Nuclear Weapons Tests and Cancer Risks; American Scientist/the magazine of Sigma Xi, The Scientific Research Society/;2006, Pages 48-57

20. Michael Eisenstadt, Omar Mukhlis, The Washington Institute for Near East Policy; The Potential for Radiological Terrorism by al-Qaeda and the Islamic State; Aug 10, 2016; Page 3

21. WHO/RAD Information sheet February 2003, Radiological Dispersion Device (Dirty Bomb), Page 1.

22. Yoav Yehezkelli MD, Tsvika Dushnitsky MD and Ariel Hourvitz MD; Radiation Terrorism - The Medical Challenge; Non-Conventional Warfare Medicine; IMAJ. July 2002; Pages 530- 534

23. Anthony B. Wolbarst, PhD; Albert L. Wiley, Jr, MD, PhD; Jeffrey B. Nemhauser, MD Doran M. Christensen, DO; William R. Hendee, PhD; Medical Response to a Major Radiologic Emergency: A Primer for Medical and Public Health Practitioners; radiology.rsna.org n Radiology: March 2010; Pages 660-677

24. Luis Domínguez-Gadea, Laura Cerezo; Decontamination of radioisotopes; Reports of practical oncology and radiotherapy 1 6(2011)147–152; ScienceDirect (Elsevier).

25. Goh S H; Bomb blast mass casualty incidents: initial triage and management of injuries; Singapore Med J 2009; 50 (1): 101-106 (CME Article); Pages 104, 105

26. Rump Alexis, Benjamin Becker, Stefan Eder, Andreas Lamkowski, Michael Abend & Matthias Port; Medical management of victims contaminated with radionuclides after a “dirty bomb’’attack, Military Medical Research, Article number: 27 (2018); Pages 1-10

27. Homeland Security/Science and Technology; National Urban Security Technology Laboratory; Radiological Dispersal Device (RDD) Response Guidance: Planning for the First 100 Minutes; November 2017, Pages 1-74, Page 18

28. Dallas Cham E., Kelly R. Klein, Thomas Lehman, Takamitsu Kodama, Curtis Andrew Harris, and Raymond E. Swienton; Readiness for Radiological and Nuclear Events among Emergency Medical Personnel, Frontiers in Public Health, Aug 18, 2017; Pages 1-9

29. Centers for Disease Control and Prevention/Radiological Terrorism: Emergency Management Pocket Guide for Clinicians

30. Ran D. Balicer, Christina L. Catlett, Daniel J. Barnett, Carol B. Thompson, Edbert B. Hsu, Melinda J. Morton, Natalie L. Semon, Christopher M. Watson, Howard S. Gwon, Jonathan M. Links; Characterizing Hospital Workers’ Willingness to Respond to a Radiological Event; PLoS ONE, www.plosone.org; October 2011; Pages 1-7

31. Peter D. Zimmerman with Cheryl Loeb; Dirty Bombs: The Threat Revisited; Defense Horizons, January 2004, Pages 1-11

32. Milad AHMADI MARZALEH, Rita REZAEE, Abbas REZAIANZADEH, Mahnaz RAKHSHAN, Gholamhassan HADDADI, Mahmoudreza PEYRAVI; Effective Factors in Improving the Emergency Department Preparedness of Hospitals in Radiation and Nuclear Incidents and Nuclear Terrorism: A Systematic Review; Iran J Public Health, Mar 2020, pp. 437-446; Page 443

33. Milad Ahmadi Marzaleh, MPH, PhD; Rita Rezaee, Phd; Abbas Rezaianzadeh, PhD; Mahnaz Rakhshan, PhD; Gholamhassan Haddadi, PhD; Mahmoudreza Peyravi, MD, PhD; Design and validation of a hospital emergency department preparedness questionnaire for radiation accidents, nuclear accidents, and nuclear terrorism in Iran, Am J Disaster Med. 2020 Fall;15(4):283-292.

34. Suzanne Lobaton Cabrera, RN, MN, Randal D. Beaton, PhD, EMT, Phyllis Berryman, RN, MBA, COHN-S/CM, FAAOHN, Eileen Lukes, PhD, RN, COHN-S, CCM, FAAOHN; The Role of Occupational Health Nurses in Terrorist Attacks Employing Radiological Dispersal Devices; AAOHN Journal, First Published March 1, 2009, pp.112-121, Page 117

35. R. Bar-Deroma, L. Otits, K. Berkovits-Shir; HOSPITAL PREPAREDNESS FOR A RADIOLOGICAL TERRORIST EVENT; Department of Oncology, Rambam Health Care Campus, Haifa, Israel School of Medicine, Technion IIT, Haifa, Israel.

36. Jerome A. Paulson, MD, FAAP, COUNCIL ON ENVIRONMENTAL HEALTH; Pediatric Considerations Before, During, and After Radiological or Nuclear Emergencies; PEDIATRICS(FROM THE AMERICAN ACADEMY OF PEDIATRICS), December 2018; Pages 1-7

37. Deborah H. Kim, APRN, MSN, CHEP; Emergency Preparedness and the Development of Health Care Coalitions\A Dynamic Process; Nurs Clin North Am. 2016 Dec; 51(4): 545–554.

38. Aruna C. Ramesh and S. Kumar; Triage, monitoring, and treatment of mass casualty events involving chemical, biological, radiological, or nuclear agents; J Pharm Bioallied Sci. 2010 Jul- Sep; 2(3): 239–247.

39. Hoon Chin Steven Lim, MBBS (Singapore), MRCS A&E (Edinburgh), Keng Sin Ng, MBBS (Singapore), FRCR (UK), Hock Heng Tan, MBBS (Singapore), FRCS A&E (Edinburgh), Kok Wah Gabriel Leong, MHSM (Australia), GDipHML; Hospital Preparedness for Radiation Emergencies and Medical Management of Multiple Combined Radiation Injury Victims(Proceedings of Singapore Healthcare);2011; Pages 197-207

40. REMM: Mass Casualty; Radiation + Trauma (Combined Injury); Psychological Issues for Radiation Emergencies.

SECTION OF HUMANITIES AND PHILOLOGY

ETHNOCULTURAL SPECIFICITY OF THE CONCEPT "HOLIDAY" IN THE LINGUISTIC WORLDVIEW (BASED ON ENGLISH, FRENCH, AND RUSSIAN)

Issina G.
Scientific Supervisor
Prof., Ph.D., Ye.A. Buketov Karaganda National Research University, Karaganda, Kazakhstan
ORCID ID: https://orcid.org/0000-0003-1853-8901
Anikina V.
Student, Ye.A. Buketov Karaganda National Research University, Karaganda, Kazakhstan
DOI: 10.5281/zenodo.18656061

Abstract
The article examines the concept of "holiday" as a key ethnocultural unit in English, French, and Russian linguistic worldviews. The study aims to identify semantic, cognitive, and cultural features of the concept through lexicographic analysis and ethnocultural interpretation. Using dictionary definitions, linguistic data, and culturally significant holidays (Christmas, La Saint-Martin, and Maslenitsa), the research reveals national-specific meanings, symbols, and values. The novelty of the work lies in the comparative cognitive analysis of the concept as realized in language, ritual, and phraseology.
Keywords: concept, holiday, linguistic worldview, ethnoculture, semantics.

Relevance. The relevance of this study is determined by the need to decode the cultural codes of different peoples through their basic concepts. The concept of "holiday" is particularly suitable for such an analysis, as it accumulates historical, religious, and ethnocultural characteristics. In an era of active intercultural dialogue, understanding how the English, French, and Russians conceptualize joyful events allows not only to reveal the ethnocultural specificity of their thinking but also to gain a deeper insight into the structure of ethnocultural linguistic worldviews.

In modern linguistics, the "concept" serves as a primary category for studying mental structures that reflect ethnocultural values. According to N. D. Arutyunova, a concept represents everyday human understanding of the world, formed from folk tales, traditions and moral notions. It functions as a "a kind of cultural layer mediating between a person and the world" [1, p. 37].

Within this framework, the concept of "*holiday*" serves as a representative unit for analyzing ethnoculturally grounded interpretations in English, French, and Russian. In cognitive linguistics, such concepts are viewed as dynamic mental structures, evolving from perceptual representations into complex formations with rational and evaluative components [9]. These structures collectively form the linguistic worldview, through which speakers process information using categories shaped by their unique historical and social context [13, p 73–76]. Ethnocultural specificity is most vividly manifested in linguistic units and fixed expressions that lack exact equivalents in other languages, reflecting the unique conceptual sphere of a nation.

Materials and Research Methods. The study is based on lexicographic data from contemporary explanatory dictionaries of English, French, and Russian, including the Cambridge Dictionary, the Larousse dictionary, as well as explanatory dictionaries by S. I. Ozhegov and D. N. Ushakov. Illustrative material was drawn from fiction, media sources, and ethnocultural descriptions of holidays. The research employs methods such as sampling of lexical units, descriptive and semantic analysis of dictionary definitions, comparative analysis, and elements of cognitive-conceptual analysis aimed at identifying the ethnocultural specifics of the concept "holiday" in English, French, and Russian linguistic worldviews.

While the concept of "*holiday*" can be analyzed at the level of lexical meaning and cognitive structure, its full ethnocultural significance is revealed through concrete cultural practices. To illustrate how the semantic components of this concept are realized in linguistic and cultural contexts, it is relevant to examine representative holidays in English, French, and Russian traditions. Examining these holidays allows us to move beyond abstract definitions and see how the concept of "*holiday*" integrates religious, historical, social, and moral dimensions, expressed through symbols, rituals, phraseological units, and everyday language.

Results and Discussion. In the English linguistic worldview, the concept of "*holiday*" is primarily represented by the lexical units: *holiday*, *celebration*, and *festival*, each emphasizing different aspects of festive events.

According to the Cambridge Dictionary, *holiday* is defined as "an official day when you do not have to go to school or work." The etymology of the word (*holy day*) highlights its historical connection with religious observances, while in modern usage it mainly emphasizes the idea of rest and exemption from everyday duties. For instance, the sentence "Christmas Day is a public holiday in the UK" demonstrates that *holiday* functions as an official day off recognized at the state level [3].

Another important lexical unit is *celebration*, which is defined as "an occasion when you celebrate a special day or event." This definition shifts the focus from the formal status of a day to its emotional and event-based significance. In the example "Let's buy some champagne in celebration of her safe arrival," the

word *celebration* denotes a joyful event marking an important moment [3].

The dictionary also provides a second meaning of "celebration" — "the act of celebrating something," which emphasizes the process of preparation and participation. Thus, in the sentence "Preparations were under way for his 80th birthday celebration in September," *celebration* refers to the active organization and collective involvement in the festive process, highlighting its emotional and social dimensions [3].

The lexical unit *festival* complements this semantic field. Its first definition — "a special day or period when people celebrate something, especially a religious event" — stresses the connection with tradition, ritual, and a specific time frame. The second meaning — "a series of special events, performances, etc. that often takes place over several days" — expands the concept to include large-scale public events. For example, "The Edinburgh International Festival is a major celebration of music, theatre and dance, attracting visitors from all over the world" illustrates that *festival* may encompass cultural, artistic, and social activities extending beyond purely religious or personal celebrations [3].

To illustrate how these semantic components are realized in ethnocultural practice, it is relevant to consider one of the most significant English holidays — Christmas. Among such holidays as Halloween, Easter, Guy Fawkes Night, and St. George's Day, Christmas occupies a special place, as it reflects both religious tradition and ethnocultural values of the English linguistic community. Christmas is a major Christian holiday celebrated in honor of the birth of Jesus Christ. Although the exact date of Christ's birth is unknown, in the fourth century the Christian Church established December 25 as the day of celebration. This date coincided with ancient pagan winter solstice festivals, such as Saturnalia and Yule, symbolizing light, renewal, and new beginnings.

In England, Christmas is marked by various festive practices, including theatrical performances known as *Mysteries*, which depict biblical scenes related to the birth of Christ and reinforce the religious foundations of the holiday [4]. At the same time, Christmas functions as a public holiday (*holiday*), a joyful family event (*celebration*), and a culturally rich festive period (*festival*), thus integrating all the key semantic features identified in the dictionary analysis.

Christmas is also characterized by a rich system of symbols deeply rooted in tradition. The Christmas tree symbolizes eternal life and renewal; Santa Claus embodies kindness and generosity; the Christmas star represents the Star of Bethlehem and symbolizes spiritual guidance and hope. Carols create an atmosphere of unity and joy, while mistletoe symbolizes reconciliation, love, and peace. These symbols not only enhance the emotional intensity of the holiday but also reflect shared ethnocultural meanings.

An important role in the representation of Christmas is played by phraseological expressions that convey its cultural significance in everyday language. Expressions such as "Merry Christmas", "Deck the halls", and "Christmas came early" verbalize joy, anticipation, and festive preparation. The phrase "Good things come in small packages" emphasizes emotional value over material wealth, while the idiom "The proof of the pudding is in the eating" highlights the idea that the true meaning of Christmas is revealed through lived experience, shared moments, and interpersonal warmth.

Thus, Christmas serves as a vivid example of how the English concept of "*holiday*" is realized in ethnocultural practice, combining official recognition, emotional celebration, collective participation, symbolism, and linguistic expression. It clearly demonstrates how dictionary meanings are embodied in traditions, rituals, and everyday speech, reflecting the values and worldview of English linguoculture.

Next, we will examine how the concept of "*holiday*" is represented in the French language.

In French, the concept of "*holiday*" is represented by the single word *fête*, which encompasses a range of social, religious, and personal celebrations. According to the Larousse dictionary, "*fête*" can denote a *"Solennité religieuse ou cérémonie commémorative"* (a religious celebration or commemorative ceremony), such as *"La messe de Noël est une fête solennelle pour les fidèles"* (The Christmas Mass is a solemn celebration for the faithful).

The second meaning is *"Jour consacré à la mémoire d'un saint considéré comme le patron d'un pays, d'un groupe, d'une profession ou dont une personne a reçu le nom comme prénom"* (a day dedicated to the memory of a saint considered the patron of a country, a group, a profession, or after whom a person has been named), reflecting the national-religious aspects of holidays honoring saints or patrons. For instance: *"La fête de la Saint-Patrick est célébrée en Irlande et dans le monde"* (Saint Patrick's Day is celebrated in Ireland and around the world).

The third meaning is *"Réjouissances publiques destinées à commémorer périodiquement un fait mémorable, un événement, un héros, etc."* (public festivities intended to periodically commemorate a memorable fact, an event, a hero, etc.), covering national or civic holidays. For example: *"Le 14 Juillet est une fête nationale en France"* (July 14th is a national holiday in France).

Finally, "*fête"* can also refer to *"Réjouissances, festin, bal offerts par quelqu'un en l'honneur de quelque chose"* (rejoicings, a feast, or a ball organized by someone in honor of something), highlighting family or personal celebrations. For example: *"Ils ont organisé une fête pour l'anniversaire de leur enfant"* (They organized a party for their child's birthday) [6].

To illustrate how the semantic components of the concept "**fête"** are realized in French ethnocultural practice, it is relevant to consider one of the most representative and symbolically rich French holidays — **La Saint-Martin**. This holiday celebrated on 11 November. It marks the end of the agricultural year and the transition from autumn to winter, while also having Christian roots. It commemorates Saint Martin of Tours, a fourth-century Roman soldier who became a bishop and was renowned for his charitable act of sharing his cloak with a poor beggar [5, p. 8].

The central symbol of La Saint-Martin is *le manteau de Saint Martin* (Saint Martin's cloak), representing compassion, generosity, and solidarity. This symbolic image is reflected in the French phraseological unit *"partager son manteau"*, meaning to help others selflessly or to share what one has with those in need. Another key element is "*la lumière*", symbolizing hope and inner warmth during the dark season, particularly visible in children's lantern processions, where light metaphorically conveys moral guidance and human kindness.

Linguistically, La Saint-Martin is associated with stable expressions that reflect folk beliefs and seasonal changes. For example, *"À la Saint-Martin, l'hiver est en chemin"* emphasizes this day as a turning point in the natural cycle, while *"être une lumière pour quelqu'un"*, often linked to this holiday, conveys the idea of supporting and guiding others, aligning with Saint Martin's ethical message [7].

In contemporary French culture, La Saint-Martin is preserved mainly through regional traditions and educational practices, interpreted as a holiday of sharing and moral values. Thus, La Saint-Martin illustrates how the French concept of "*fête*" integrates religious meaning, symbolic imagery, and social ethics, reflecting important ethnocultural values of French society.

Having examined the concept of "*holiday*" in the English and French linguistic worldviews, we can now proceed to analyze its representation in the Russian language.

In the Russian linguistic worldview, the concept of "*holiday*" is represented by the lexical unit «*праздник*», which combines official, social, emotional, and collective meanings. According to Ozhegov's Explanatory Dictionary, «*праздник*» is defined as «день торжества, установленный в честь чего-либо или в память кого-либо» (a day of celebration established in honor of something or in memory of someone). This definition primarily refers to historical, religious, and social events that possess collective significance. For example, Metropolitan Anthony writes: «Из года в год возвращается светлый, всерадостный праздник Рождества Христова» (Year after year returns the bright, all-joyful holiday of Christmas), emphasizing the sacred and recurring nature of religious celebration in Russian culture [11].

The same dictionary also records a more modern interpretation of «*праздник*» as «день массовых игр и развлечений» (a day of mass games and entertainment), reflecting the transformation of the concept in contemporary society. This meaning is widely realized in educational and social contexts, where teachers organize events such as Health Day, Sports Day, or Alphabet Day. A representative example from the media illustrates this usage: «Олимпиада была прекрасно организована, и хотя без недоразумений не обошлось, в целом великий праздник спорта, несомненно, удался» (The Olympics were excellently organized, and although there were some misunderstandings, overall, the great sports festival was undoubtedly a success) [10]. In this case, «*праздник*» denotes a large-scale public event characterized by collective participation and emotional uplift.

Ushakov's dictionary further enriches the semantic structure of the concept by defining «*праздник*» as «счастливый, радостный день, ознаменованный каким-нибудь важным, принятым событием, удачей и т.п.» (a happy, joyful day marked by some important or successful event) [12]. This interpretation foregrounds the emotional and subjective dimension of the concept, highlighting personal and communal joy. An illustrative example can be found in Eduard Limonov's work *We Had a Great Era*: «В один прекрасный осенний день по Свердлова пустили (это был праздник) трамвай! » (On one fine autumn day, a tram was allowed to run along Sverdlova Street — it was a holiday!) [8]. Here, the word «*праздник*» metaphorically designates a socially meaningful event that brought joy to the residents, demonstrating the emotional and communal value of the concept.

A more complete understanding of the concept can be achieved through the analysis of its synonyms. One of them is «*торжество*», which denotes a solemn festivity held in honor of a significant event, for example: «Торжество по случаю победы» (Celebration on the occasion of a victory). This lexical unit emphasizes grandeur, importance, and elevated emotional tone. Another synonym is «*гулянье*», which refers to a public outdoor festivity and highlights the collective and social character of celebration. An example is «Народные гулянья на Масленицу» (Public festivities during Maslenitsa) [12]. These synonyms reveal the collective, emotional, and ritual nature of the Russian understanding of a holiday.

To illustrate how the semantic components of the concept «*праздник*» are realized in ethnocultural practice, it is relevant to consider one of the most ancient and symbolically rich Russian holidays — Maslenitsa. Alongside such important holidays as New Year, Easter, and Christmas, Maslenitsa occupies a special place in Russian linguoculture due to its deep historical roots and vivid ritual structure. Maslenitsa is celebrated during the last week before Great Lent and is associated with the transition from winter to spring. The name of the holiday originates from Orthodox tradition: during this week meat is excluded from the diet, while dairy products are still permitted, which explains the central role of pancakes.

The tradition of celebrating Maslenitsa dates back to ancient times and is connected with pagan Slavic rituals aimed at banishing winter and welcoming spring. Over time, these rituals merged with Christian practices, forming a complex ethnocultural phenomenon. Today, Maslenitsa is perceived as a holiday of farewell to winter and the anticipation of renewal [2, p. 3–4].

Maslenitsa is deeply embedded in the Russian linguoculture. Its symbolism and vocabulary reflect folk ideas about the cyclical nature of time, seasonal change, and communal unity. The primary symbol of the holiday is the *pancake*, which personifies the sun and the arrival of spring. This symbolism is reflected in commonly used expressions such as "bake pancakes" and "pancake day." Another key element is the *scarecrow*, symbolizing winter, which is traditionally burned at the end of the week, marking the transition to spring. The final day of Maslenitsa, known as *Forgiveness Sunday*,

emphasizes moral purification and reconciliation; typical expressions include “Forgive me” and “Forgiveness Sunday.”

Phraseological units associated with Maslenitsa further demonstrate the ethnocultural specificity of the concept. The expression “*First pancake’s a bust*” conveys the idea that initial attempts may be unsuccessful. “*Wide Maslenitsa*” symbolizes abundance, generosity, and the scale of festivities. The phrase “*On Maslenitsa the soul went wild*” reflects unrestricted joy and collective merriment, while “*Maslenitsa without pancakes is like a birthday party without pies*” emphasizes the inseparability of a holiday from its core symbolic attributes.

Thus, Maslenitsa serves as a vivid example of how the Russian concept of *праздник* is realized in ethnocultural practice, combining ritual, symbolism, collective celebration, and emotional expression. It demonstrates that in the Russian linguistic worldview a holiday is not merely an official date, but a socially and emotionally meaningful event deeply rooted in tradition and shared cultural memory.

Conclusion. The analysis of the concept of “*holiday*” across English, French, and Russian linguistic worldviews demonstrates that while the notion of a holiday is universal, its realization is deeply shaped by ethnocultural factors. In English, the concept emphasizes formal recognition, rest, and joy, as exemplified by Christmas, which integrates religious tradition, public celebration, and symbolic imagery. In French, the concept is represented by “*fête”*, encompassing religious, historical, social, and personal dimensions, with La Saint-Martin illustrating how ethical values, communal participation, and symbolic acts such as sharing a cloak are expressed through language and cultural practices. In Russian, the concept of “*праздник*” combines official, social, emotional, and collective meanings, with Maslenitsa exemplifying the integration of ancient rituals, seasonal symbolism, communal festivity, and moral dimensions.

Through the examination of these holidays, it becomes evident that the concept of “*holiday*” is not limited to a day of leisure or entertainment. Rather, it functions as a complex conceptual unit that reflects a community’s historical experience, ethical norms, seasonal perceptions, and collective identity. Rituals, symbols, phraseological units, and everyday language serve as carriers of these meanings, allowing members of a culture to transmit and preserve shared values across generations.

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References

1. Arutyunova N.D. Yazyk i mir cheloveka. – M., 1999. – p. 896

2. Bocharova N.N. Prishla Maslenicza: Informacionnyj buklet. - Davydovka, 2018. – 6 s.

3. Cambridge Dictionary [Electronic source]. – Available at: https://dictionary.cambridge.org/ru/. – Date of access: 09.01.2026.

4. Falcon HR Solutions. History of Christmas [Electronic source] - 2015. - Available at: https://www.linkedin.com/pulse/history-christmas-falcon-hr-solutons. - Date of access: 15.01.2026.

5. Krupa, Renata, et Iwona Piechnik, dirs. *Traditions et leur transmission dans les pays romans et slaves*. Kraków: Avalon, 2022. – p. 19

6. Larousse. Fête [Electronic source]. – Available at: https://www.larousse.fr/dictionnaires/francais/f%C3%AAte/33431. – Date of access: 09.01.2026.

7. La Fête de la Saint-Martin: La lumière du partage [Electronic source]. – Available at: https://pedagogie-waldorf.fr/la-fete-de-la-saint-martin/. – Date of access: 13.01.2026.

8. Limonov E. U nas byla Velikaya Epokha: dokumental’nyj roman. – SPb.: Amfora, 2002. – 192 s.

9. Maslova V.A. Vvedenie v kognitivnuyu lingvistiku. – M.: Flinta, 2007. – 259 s.

10. National Corpus of Russian Language [Electronic source]. – Available at: http://www.ruscorpora.ru/. – Date of access: 09.01.2026.

11. Ozhegov S.I. Tolkovyj slovar’ russkogo yazyka [Electronic source]. – Available at: https://slovarozhegova.ru/word.php?wordid=5905. – Date of access: 09.01.2026.

12. Ushakov D.N. Tolkovyj slovar’ [Electronic source]. – Available at: http://ushakovdictionary.ru. – Date of access: 09.01.2026.

13. Yazykovaya lichnost’ i perevod: sb. materialov II Mezhvuz. nauch.-obrazovat. foruma molodykh perevodchikov, Minsk, 5–6 dek. 2017 g. / BGU, fak-t sotsiokult. komm.; redkol.: S.V. Vorobyeva (otv. red.), N.S. Zelezinskaya, A.F. Shapovalova. – Minsk: Izd. tsentr BGU, 2018. – P. 73–76.

СЛОВА СО ЗНАЧЕНИЕМ ПРИЗНАКА В РУССКОМ ОСТРОВНОМ ГОВОРЕ АЗЕРБАЙДЖАНА

Гейдарова Э.А.
Кандидат филологических наук

WORDS WITH THE MEANING OF A FEATURE IN THE RUSSIAN ISLAND DIALECT OF AZERBAIJAN

Heydarova E.
Candidate of philology sciences
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Аннотация

Статья посвящена исследованию слов со значением признака, употребляемых в русском островном говоре Азербайджана. В результате анализа лексики говора были выявлены **27** фонетических, **53** словообразовательных, **24** лексических и **38** лексико-семантических диалектизмов, выраженных прилагательными. Помимо этого выделено **24** формы с суффиксами субъективной оценки. В исследуемом говоре слова со значением признака представлены также заимствованиями из азербайджанского языка, которые грамматически оформились как русские прилагательные. Всего отмечено **18** подобных форм. Часть примеров выражена иноязычными словами, имеющими разную степень адаптации, т.к. они не склоняются как русские прилагательные. Таких слов было выявлено **12**. Цветообозначения в языке русских переселенцев представлены не только исконными словами, но и заимствованиями (7). Всего в ходе проведенного исследования было выделено более **190** прилагательных, употребляемых в русском островном говоре Азербайджана.

Abstract

The article is devoted to the analysis of words with the meaning of a feature used in the Russian island dialect of Azerbaijan. As a result of the analysis of the vocabulary of the dialect, **27** phonetic, **53** word-formation, **24** lexical and **38** lexical-semantic dialectisms expressed by adjectives were identified. In addition, **24** forms with suffixes of subjective evaluation were identified. In the studied dialect, words with the meaning of a feature are also represented by borrowings from the Azerbaijani language, which were grammatically formed as Russian adjectives. A total of **18** such forms were noted. Some examples are expressed by foreign words that have different degrees of adaptation, since they are not declined like Russian adjectives. **12** such words were identified. Colour designations in the language of Russian settlers are represented not only by original forms, but also by borrowings. There are **7** of them. In total, more than **190** forms of adjectives of the Russian island dialect of Azerbaijan were identified during the study.

Ключевые слова: русская диалектология, островной говор, прилагательные, диалектизмы, заимствования.

Keywords: Russian dialectology, island dialect, adjectives, dialectisms, borrowings.

В XXI веке лингвисты все больше стали обращаться к проблемам развития и функционирования говоров, что обусловлено осознанием значения говоров как хранителей своеобразия национальной языковой картины мира. Исходя из этого, очень важным представляется исследование говоров, находящихся не только в пределах метрополии, но и в отрыве от нее. Функционирующие в изоляции говоры сохраняют свои специфические особенности.

Объектом исследования являются прилагательные русского островного говора Азербайджана.

Материалом исследования послужил «Лексикон русского островного говора Азербайджана». [4] «Он составлен по материалам картотеки, включающей лексику, собранную, начиная с 50-х гг. прошлого века, во время диалектологических экспедиций в русские села Азербайджана (более 20-ти сёл). К ним относятся: с. Алексеевка, с. Владимировка, с. Еленовка (ныне Гаджигусейнли), с. Нариманова (ныне Нариманабад), с. Петропавловка (ныне Деллекли) Губинского района; с. Алтыагач Абшеронского района; с. Астраханка (ныне Гызмейдан), с. Дзержиновка (ныне Икинджы Джабаны), с. Кировка (ныне Нагарахана), с. Мараза (Матраса), с. Марьевка (ныне Нагарахана), с. Хильмилли Шамахинского района; с. Ивановка Исмаиллинского района; с. Калиновка Масаллинского района; с. Русские Борисы, с. Михайловка (ныне Даирманлар) Геранбойского района; с. Мухтадыр, с. Набран Хачмазского района; с. Новоголовка (ныне Узунтепе) Джалилабадского района; с. Славянка, с. Новоивановка, с. Новосаратовка Гядабейского района». [2, с. 69]

Русский островной говор Азербайджана представляет большой научный интерес в связи с тем, что иноязычное окружение способствует сохранению, консервации в говоре многих слов, утраченных в диалектах метрополии. Следствием чего является многообразие лексики исследуемого говора. Национально-специфические особенности русского островного говора Азербайджана проявляются, в частности, в словах, которые отличаются от

соответствующих литературных форм фонетическими, словообразовательными, морфологическими, семантическими и другими характеристиками.

В результате проведенного исследования выделены слова со значением признака, которые были распределены по следующим группам:

1. ***диалектизмы****:*

а) фонетические;

б) словообразовательные;

в) лексические;

г) лексико-семантические;

2. ***прилагательные с суффиксами субъективной оценки;***

3. ***заимствованные прилагательные***;

4. ***цветообозначения***.

Фонетические диалектизмы

Общаясь друг с другом, русские переселенцы активно используют слова, которые имеют некоторые звуковые отличия от соответствующих литературных форм. Речь идет о фонетических диалектизмах. Как известно, это диалектные слова, совпадающие по значению с соответствующими словами литературного языка, но незначительно отличающиеся от них своим звуковым составом (либо одним звуком, либо ударением). Иначе говоря, это слова литературного языка, произносимые в данной местности со звуковой деформацией.

В языке русских переселенцев были выявлены следующие *фонетические* диалектизмы:

азербижа́нский *– азербайджанский,* ***аллянóй*** *– льняной,* ***антере́сный*** *– интересный,*

бама́жный *– бумажный,* ***бе́шный*** *– бешеный,****бу́нишний*** *- буднишний,* ***бурдóвый*** *– бордовый;****идинóли́чный*** *– единоличный,* ***искуве́рканный*** *– исковерканный,* ***кра́женый*** *– краденый,* ***кра́сенький*** *– красненький,* ***крашóный*** *– крашеный,* ***ма́ненький*** *– маленький,* ***нóнешний*** *– нынешний,* ***оллянóй*** *– льняной,* ***оржанóй*** *– ржаной,* ***селепóй*** *– слепой,* ***слобóдный*** *– свободный,* ***современный*** *– современный,* ***суме́жный*** *– смежный,* ***сурьёзный*** *– серьёзный,* ***сысланный*** *– сосланный,* ***тодышний*** *– тогдашний,* ***тощóй*** *– тощий,* ***хла́дный*** *– холодный,* ***чажёлый*** *– тяжёлый,* ***чера́шний*** *– вчерашний.*

Всего было выявлено **27** фонетических диалектизмов.

Словообразовательные диалектизмы

В исследуемой лексике русского островного говора Азербайджана нашли отражение диалектные слова, отличающиеся от соответствующих литературных словообразовательными морфемами, т.е. «*по своим корневым морфемам и лексическому значению эти слова тождественны словам литературного языка*». [7, с. 98]

В ходе анализа были выявлены следующие *словообразовательные* диалектизмы:

айви́ный *– айвовый,* ***алчи́ный*** *– алчовый;* ***барсучи́ный*** *– барсучий,* ***безвнима́тельный*** *– невнимательный,* ***бездви́жный*** *– неподвижный,* ***бездомóвный*** *– бездомный,* ***беззва́нный*** *– незваный,* ***беспреме́нный*** *– непременный,* ***беспривéтливый*** *– неприветливый,* ***беспривычный*** *– непривычный,* ***бессча́стный*** *– несчастный;* ***ви́слый*** *– висячий,* ***волчи́ный*** *– волчий,* ***ворчи́стый*** *– ворчливый;* ***гли́ный*** *– глиняный,* ***гречи́чный*** *– гречневый;* ***дли́ньше*** *– длиннее,* ***дога́дистый*** *– догадливый,* ***драчи́стый*** *– драчливый;* ***жаре́йче*** *– жарче;* ***излежа́лый*** *– залежалый;* ***кози́ный*** *– козий,* ***колхóзский*** *– колхозный,* ***краси́вше*** *– красивее,* ***кре́мный*** *– кремовый,* ***кунжу́товый*** *– кунжутный;* ***любый*** *– любимый,* ***лягуши́ный*** *– лягушачий;* ***мальчи́шный*** *– мальчишеский,* ***многоде́тский*** *– многодетный,* ***мужчи́нский*** *– мужской,* ***мыша́тый*** *– мышиный,* ***мясови́тый*** *– мясистый;* ***надоéдный***– *надоедливый;* ***оби́дливый*** *– обидчивый,* ***охóтницкий*** *– охотничий;* ***парусóвый*** *– парусиновый,* ***присме́ртный*** *– предсмертный,* ***прожóристый*** *– прожорливый,* ***проливéнный*** *– проливной;* ***ра́дый*** *– радостный,* ***русявый*** *– русый;* ***свини́ный*** *– свиной,* ***сла́бже*** *– слабее,* ***слади́мый*** *– сладкий,* ***снежли́вый*** *– снежный,* ***сольнéй*** *– солонее,* ***стари́нский*** *– старинный,* ***стыди́стый*** *– стыдливый,* ***суетнóй*** *– суетливый,* ***суро́дованный*** *– изуродованный;* ***тыкву́шный*** *- тыквенный;* ***уго́дистый*** *– угодливый;* ***хро́мый*** *– хромовый.*

В результате проведенного исследования выявлены **53** формы.

Лексические диалектизмы

Как известно, к лексическим диалектизмам относятся слова, совпадающие с литературными по значению, но отличающиеся от них своим звуковым набором. Они «*имеют в литературном языке синонимы с иным корнем*». [8, с. 69]

В островном говоре зафиксированы такие собственно-лексические диалектизмы, как:

артачнóй *– упрямый,* ***белёсый*** *– светло-розовый,* ***вóхкий*** *– сырой, влажный,* ***едови́тый*** *– съедобный, вкусный,* ***каржиный*** *– вороний,* ***квёлый*** *– слабый, хилый,* ***кла́тный*** *– старый, дряхлый,* ***клёклый*** *– вязкий,* ***невладимый*** *– невменяемый,* ***нехалюзный*** *– плохой,* ***обма́рный*** *– грязный,* ***патла́тый*** *– растрепанный,* ***разла́тый*** *– плоский,* ***сисявый*** *– шепелявый,* ***сряжóнный*** *– украшенный,* ***тюкнутый*** *– сумасшедший,* ***у́шлый*** *– хитрый;* ***фарóбный*** *– больной,* ***халявый*** *– неграмотный,* ***хворóбный*** *– больной,* ***че́здый*** *– гнилой,* ***швыдкий*** *– быстрый,* ***шу́стрый*** *– быстрый;* ***ядрёный*** *– крупный.*

Всего выделено **24** собственно-лексических диалектизма.

***Лексико-семантические* диалектизмы**

К лексико-семантическим диалектизмам относятся слова, которые совпадают в написании и произношении с литературными, но отличаются от них своим значением.

Исследование языка русских переселенцев привело к выявлению следующих лексико-семантических диалектизмов, выраженных словами со значением признака:

безнадёжный *– ненадёжный,* ***беспокóйный*** *– сумасшедший,* ***бессúльный*** *– бедный,* ***бесцéнный*** *– дешевый,* ***бла́го*** *– хорошо;* ***вре́дный*** *– крепкий* (об уксусе, перце, водке), ***выгодный*** *– остроумный;* ***гла́дкий*** *– толстый, полный; ухоженный,* ***гнилóй*** *– болезненный, слабый;* ***дворóвый*** *– домовой,* ***дóбрый*** *– целый, пригодный,* ***дурнóй*** *– глупый,* ***ду́тый*** *–*

пышный; ***живо́тный*** *– жизненный;* ***ко́жный*** *– кожаный;* ***ла́дный*** *– стройный, красивый, мирный;* ***мысленный*** *– возможный;* ***набивно́й*** *– обмазанный сверху глиной* (о доме); ***оте́ческий*** *– отечественный,* ***отрывно́й*** *– отдельный;* ***плохо́й*** *– 1) тяжело больной, умирающий; 2) некрасивый,* ***пога́ный*** *– 1) предназначенный для нечистот, отбросов; 2) скверный, дурной; 3) нечистый* (о посуде); ***по́лный*** *– здоровый,* ***пре́сный*** *– сладкий,* ***пусто́й*** *– ложная беременность;* ***ре́зкий*** *– тесный,* ***ряженный*** *– вышитый;* ***самостоятельный*** *– положительный, достойный уважения,* ***све́тлый*** *– грамотный,* ***си́льный*** *– обильный,* ***слепо́й*** *– неграмотный,* ***срабо́танный*** *– нетрудоспособный,* ***стра́шный*** *– большой;* ***хла́дно*** *– медленно, пассивно,* ***хоро́ший*** *– всеми уважаемый, почитаемый,* ***хромо́й*** *– бедный,* ***худо́й*** *– дырявый;* ***шу́бный*** *– кожаный.*

В результате анализа выявлено **38** примеров.

Прилагательные с суффиксами субъективной оценки

«*В русском островном говоре очень продуктивным способом выражения экспрессивности является суффиксация*». [3, с. 191] Именно поэтому в лексике говора употребляется достаточно большое количество прилагательных с суффиксами субъективной оценки: ***белобры̱сенький*** - уменьш.-ласкат. к *белобрысый*; ***бесце́нненький*** - уменьш. к *бесце́нный*; ***во́хконький*** - уменьш. к *во́хкий* (*сырой, влажный*); ***голомы̱сенький*** - уменьш.-ласкат. к *голомы́сый* (*лысый*); ***грязнючий*** - экспресс. к *грязный*; ***долгоно́сенький*** - уменьш.-ласкат. к *долгоно́сый* (*долгоносик*); ***завали̱́щенький*** - экспресс. к *завали̱́щий* (*ненужный, негодный*); ***зле́ющий*** - *очень злой;* ***малюсенький*** - *очень маленький;* ***мокрёхонький*** *и* ***мокрёшенький*** - *более мокрый;* ***нехалюзненький*** - экспресс. к *нехал©зный*; ***никудышненький*** - экспресс. к *никудышный* (*ни к чему непригодный; достойный осуждения; малый, незначительный*); ***плóхонький*** - уменьш.-ласкат. к *плохой;* ***ревнючий*** - *очень ревнивый;* ***ровнёхонький*** и ***ровнёшенький*** - *более ровный;* ***сивоу́сенький*** - уменьш.-ласкат. к *сивоу́сый* (*седоусый*); ***страхолюдненький*** - экспресс. к *страхол©дный*; ***страху́чий*** - экспресс. к *стра́шный* (*большой*); ***твердёхонький*** - экспресс. к *твердый*; ***худопа́ренький*** - экспресс. *к худопа́рый (худощавый, тощий);* ***худючий*** - экспресс. *очень худой;* ***швы̱дконький*** - экспресс. к *швы̱дкий.*

Всего было зафиксировано **24** формы.

Заимствованные прилагательные

Особенностью русского островного говора Азербайджана является то, что с самого начала своего существования на данной территории он находился в тесном иноязычном окружении. Результатом такого окружения явилось влияние азербайджанского языка на русский говор, проникновение значительного количества азербайджанских слов в лексику последнего.

Еще Ф.П. Филин отмечал, что «*в диалектной лексике значительную прослойку составляют слова, заимствованные на разных этапах истории русского народа местным населением у иноязычных соседей, не получившие общерусского распространения…*» [9, вып. 1, с. 6]

Азербайджанские заимствования являются неотъемлемой частью словаря русского островного говора. При этом достаточно большое количество выявленных примеров выражено прилагательными. Их можно разбить на **5** групп:

1. Слова со значением признака, полностью ассимилированные русским островным говором, т.е. при словоизменении они подчиняются грамматическим законам русского языка, а при словообразовании использованы русские аффиксы:

Айбаласиный – сделанный из айбаласы: *Ха́ты у на́с* ***айбълас'и́ныи****, с айбъласы стро́им.* ✱ Азерб. **aybalası**– необожженный кирпич, изготовленный из глины, мелко нарубленной соломы и навоза. Прилагательное образовано с помощью русск. суффикса **-ин(ый)**.

Алачичный – принадлежащий алачиху: ***Алачи́шный*** *во́йлък, како́й пато́лшъ.* ✱ Азерб. **alaçıq** – войлочный шатер, в котором живут пастухи на летних пастбищах. Форма возникла с помощью русск. суффикса **-н(ый)** с чередованием согласного в корне.

Алчиный – алычовый: *Дл'ь* ***алчи́нъй*** *вар'ён'йи мно́уъ са́хъру на́дът'.* ✱ Азерб. **alça** – алыча + русск. **-ин(ый)**.

Аранинский – привезенный с низменности: ***Аран'и́нскъй*** *жыт'ъл' на на́шъвъ н'а схо́ш.*✱ Азерб. **aran** – низменность + русск. **-ин-** + **-ск(ий)**.

Бурунястый – длинноносый: *У* ***бурун'а́стъвъ*** *но́с до́лу'ий, о́н сво́й но́с са́м в'ид'ит.*✱ Азерб. **burun** – нос + русск. **-яст(ый)**.

Гирва́нковый – фунтовый: *γ'у́р'и* ***γ'ирва́нкъвъй*** *н'има́ - пълк'ила́ йёс'т'.* ✱ Азерб. **girvənkə**– фунт + русск. **-ов(ый)**.

Кава́чный – тыквенный: *Ка́шу* ***кава́чнуйу*** *уважа́йу.*✱Азерб. **qabag** – тыква + русск. **-н(ый)** с чередованием согласного в корне.

Карага́чево – *прил.* к карага́ч: *В'ён'ик у на́с с* ***къраγа́чьвъ*** *д'ёр'ьвъ, н'ь лама́ицъ ана́.* ✱ Азерб. **qarağaç**– вяз + русск. **-ев(о)**.

Каржыный – вороний: *γн'издо́* ***каржынуйу*** *р'иб'а́тъ ръзарил'и.*✱ Азерб. **qarğa** – ворона + русск. **-ин(ый)** с изменением **г → ж**.

Майму́нский – *экспресс*. обезьяний: *Ну, γл'ид'и́, ўс'ё пава́тк'и* ***майму́нск'ийь.***✱ Азерб. **meymun** - обезьяна+ русск. **-ск(ий)**.

Мо́рушный – малиновый: *Вар'ён'йу* ***мо́рушнуйу*** *варил'и, изв'ин'а́йус', мал'и́нъвуйу.* ✱ Азерб. **moruq**– малина + русск. **-н(ый)** с чередованием согласного в корне.

Сама́нный и **сама́новый** – *прилаг*. к сама́н: *С'т'ина́ аднасло́йнъйь ис к'ирп'ича́* ***сама́ннъуъ.***✱ Азерб. **saman**– солома + русск. **-н(ый)**; азерб. **саман** – солома + русск. **-ов(ый)**.

Тандырский. В выражении: **тандырский чуре́к** – чурек, испеченный в тандыре: ***Тан'д'и́рск'ий*** *чур'ёк са́мый фку́сный.*✱ Азерб. **təndir**– печь в виде колодца на глубине не более 1 метра. Прилагательное возникло с помощью русск. **-ск(ий)**.

Чалтыковый – относящийся к чалтык: ***Чалтыкъвыйь*** *планта́цыи у на́с.* ✱ Азерб. **çəltik**– неочищенный от шелухи рис + русск. **-ов(ый)**.

Чопу́рый и **чипу́рый** – то же, что чопу́р: *Каму́ во́спъ лицо́ нам'е́т'илъ, то́т* ***чапу́рый***. ✱ Азерб. **çopur –** рябой; имеющий оспины на лице+ русск. **-ый**.

Шо́рный – прилаг. к шор: *Ишшо́ мы д'е́лъйьм шо́рныйь п'ирашк'и́.* ✱ Азерб. **şor**– присоленный творог + русск. **-н(ый)**.

2. «*Слова, имеющие иноязычные особенности звукового оформления, в то же время вошедшие в грамматическую систему русского островного говора и подчиняющиеся соответствующим нормам словоизменения*» [1, с. 26]:

Джарышный – относящийся к джарыку: *А то́т път'ихо́н'к'у и пънадр'е́зъл мътузо́чк'и* ***д'ж'арышныи***.✱Азерб. **çarıq** – лапти + русск. **-н(ый)** с изменением заднеязычного согласного в **ш**.

Джо́мушный – буйволиный. ✱ Азерб. **camış** – буйвол. Прилагательное образовано при помощи русск. суффикса **-н(ый)**.

3. Слова со значением признака, не полностью ассимилированные русским островным говором, т.к. данные формы хоть и изменяются по законам грамматики русского языка, но при их образовании не использовались русские суффиксы; они не оформлены как прилагательные, а сохраняют свой исконный звуковой облик:

Кеча́л и **кеча́ль** – лысый (-ая). *В'иск'и́ пъвыла́з'ил'и,* ***к'ича́л'*** *ско́ръ бу́ду.* ✱ Азерб. **keçəl** – лысый.

Узу́н – длинный (шутливая кличка человека): ***Узу́н*** *Ива́н, а то́ и про́стъ ска́жут'* ***Узу́н*** *, этъ кауда́ с'ирча́ит'.* ✱ Азерб. **uzun** – длинный, долгий, продолжительный.

Хвагыр – мирный, скромный, тихий: ***Хваугыр****чьлав'е'к - зна́чит' н'икаво́ н'ь зъб'ижа́ит', см'и́рнъ жыв'о́т'.* ✱ Азерб. **fağır**. В слове наблюдается изменение **ф → хв**. Как известно, в истории русского языка не было фонемы **ф**. Она возникла после падения редуцированных гласных в результате двух процессов – ассимиляции по глухости и оглушения звонкого **в** на конце слова. В некоторых говорах до сих пор фонема **ф** заменяется звуками, схожими с ней по фонетическим признакам, например **п**, **хв**. В исследуемом русском островном говоре Азербайджана вместо **ф**, в основном, употребляется сочетание **хв**.

Чопу́р, **чипу́р** и **чупу́р** – рябой человек, имеющий оспины на лице; употребляется и как прозвище: *Чапу́р – этъ р'або́й.* // ж. **чопура́**: *Чупу́р – нъ муш'ш'и́ну, а жэн'ш'ш'инъ – чупура́.* ✱ Азерб. **çopur**.

Язу́х – бедный (бедняк): *А мы был'и йазу́х'и*. ✱ Азерб. **yazıq**.

4. Слова, лишенные форм словоизменения, но участвующие в образовании новых слов, которые принимают русские аффиксы:

Ары́х – худой, тощий // **арыхча́** – худой ребенок. ✱ Азерб.**arıq**.

5. Слова, не имеющие форм словоизменения и не участвующие в образовании новых слов, например:

Кичик – "*малый*, *маленький* (в обращении к детям)". ✱ Азерб. **kiçik**.

Сары – животное со шкурой желтоватого цвета. *Каро́ву сары зав'о́м, къ ана́ рыжу́хъ.* ✱ Азерб. **sarı** – желтый.

Сарыту́рш и **сарыту́ш** – местный сорт яблок жёлто-красного цвета, кисло-сладкие на вкус: *Ф саду́ у на́с расту́т мно́уъ йа́блъкъф: шафра́н, кана́дъ, нъпъл'ио́н, с'ина́п, сърыту́ш.* ✱ Азерб. *диал*. **sarıturş** – сорт яблок (Губинский район); **sarı** – жёлтый, **turş** – кислый.

Хам – 1. Неприрученный, дикий (о животных). 2. Необъезженная (о лошади). // В выражениях: **ха́м джюнгя** – неприрученный бычок; **ха́м ине́к** – неспокойная корова; корова, не подпускающая доить. ✱ Азерб. **xam** – сырой; неопытный, непривычный; невозделанный, целинный; **inək** – корова.

Некоторые из таких форм имеют иноязычные фонетические признаки: например:

Гялмя́– пришлый, приезжий. ✱ Азерб. **qəlmə**.

Таким образом, «*лексическое значение новозаимствованного слова формируется, уточняется, отшлифовывается по мере того, как слово включается в синтагматические и парадигматические связи со словами принимающего языка*». [6, с. 26-27] Закрепление иноязычного слова в языке сопровождается не только изменением звукового или графического облика слова. В некоторых словах в результате семантической адаптации произошло расширение лексического значения, например: **бекме́з**,**бекме́с**, **быхме́з** и **бягма́з** – 1) выварная фруктовая патока*;* 2) отварной бурак, употребляемый вместо сахара; 3) *неискренний, льстивый человек*. ✱ Азерб. **bəkməz** – патока.

В результате анализа выявлено **30** примеров.

Цветообозначения

Цветообозначения русского островного говора впервые проанализировала Л.Г. Гулиева. В своей статье «Концепт «цвет» в русском островном говоре Азербайджана» автор рассматривает лексемы, связанные с цветообозначением. Однако она выделяет и исследует русские формы, например: «***багряная*** *– масть лошади,* ***багряный*** *– коричневый, рыжеватый, серый,* ***белёсый****– светло-розовый,* ***бланжевый****– светло-желтый,* ***бурдовый*** *– бордовый,* ***бурачный*** *– лилово-красный,* ***галый****– коричневый,* ***голуба*** *–платье голубого цвета,* ***голубые цветы*** *– астры,* ***жёлто-горячий*** *– огненный, оранжевый,* ***желтый*** *– сорт меда,* ***зеленый*** *– находящийся в утробе матери, еще не родившийся жеребенок,* ***красенький*** *– красненький,* ***красна*** *– холстина,* ***красношаный*** *– милиционер,* ***красная горка*** *– последний день Пасхи,* ***красный лопух*** *– герань,* ***кремный*** *– кремовый,* ***мышатый*** *– мышиный,* ***разнокрасный*** *– разноцветный,* ***русявый*** *– русый,* ***рябый*** *– рябой,* ***синенькие*** *– баклажаны,* ***черный мед*** *– сорт меда,* ***черный пол*** *– пол чердака* и др.» [5, с. 80-81]

Целью настоящего исследования было выявление заимствованных цветообозначений. Таких форм было выявлено немного, но они есть:

Гырхмыза – сорт груш. ✱ Азерб. **qır(x)mızı** –

красный.

Карагач–карагач (вяз), южное дерево: ***Чóрныйь д'ép'ьвъ**, ана́ óчьн' стóйк'ийь, ид'от нъ пастройку дамоф. Мы йаво так и называйьм - **кръаγáч**.* ✱ Азерб. **qarağac** – вяз (**qarağac←qaraağac** – плотное, твердое, крепкое дерево; возникло от **qara** – *черный*, **ağac**– *дерево*). В островном говоре произошло оглушение **г** в **к**. Подобное изменение известно русскому языку. Достаточно вспомнить фамилию известного русского писателя Николая Михайловича Карамзина, которая произошла от татарского Кара Мирза. В тюркских языках, в том числе татарском, ***кара /гара*** означает черный.

Карагачево – прил. к *карагáч*.

Каратикян – колючий кустарник: *С **кърът'ик'áнъ** γърад'бý γарóд'ьт'.* ✱ Азерб. **qaratikan** (возникло от **qara** – черный, **tikan** – колючка).

Каратикянник – заросли кустов *каратикяна*: ***Кърът'ик'áн'н'ик** – так'и́йь кал'ýчк'и.* ✱ Азерб. **qaratikan**.

Сары – животное со шкурой желтоватого цвета: *Карóву **сары** зав'óм, къκ ана́ рыжýхъ. **Сары**? Ўрóд'ь бы трóшк'и жълтавáт'ьн'къйь.* ✱ Азерб. **sarı** - желтый.

Сарытурш – местный сорт яблок жёлто-красного цвета, кисло-сладкие на вкус. ✱ Азерб. диал. **sarıturş**– сорт яблок (Губинский район); **sarı – жёлтый**, **turş**– кислый.

В ходе проведенного исследования было выявлено **7** примеров.

Таким образом, в результате анализа лексики русского островного говора Азербайджана были выявлены **27**фонетических, **53** словообразовательных, **24** лексических и **38** лексико-семантических диалектизмов, выраженных прилагательными. Помимо этого выделено **24** прилагательных с суффиксами субъективной оценки.

В исследуемом говоре слова со значением признака представлены также заимствованиями из азербайджанского языка, которые грамматически оформились как русские прилагательные. Всего отмечено **18** подобных форм.

Часть примеров выражена иноязычными словами, имеющими разную степень адаптации, т.к. они не склоняются как русские прилагательные. Таких слов было выявлено **12**.

Цветообозначения в языке русских переселенцев представлены не только исконными формами, но и заимствованиями. Их всего **7**.

В результате проведенного исследования было выделено более **190** слов со значением признака, употребляемых в русском островном говоре Азербайджана.

Список литературы

1. Гейдарова Э.А. Иноязычная лексика в русском островном говоре Азербайджана // Вестник Томского государственного университета. № 371, Томск, 2013, с. 23-26.

2. Гейдарова Э.А. Русская языковая картина мира (на материале русского островного говора Азербайджана) // Вопросы когнитивной лингвистики. 2016, № 4, с. 68-77.

3. Гейдарова Э.А. Языковой портрет русского островного говора Азербайджана: монография. М.: Университетская книга, 2017, 304 с.

4. Гулиева, Л.Г., Гейдарова Э.А. Лексикон русского островного говора Азербайджана. Баку: Авропа, 2014, 498 с.

5. Гулиева Л.Г. Прямой и обратный словник русских онимов. Баку, 2023, 138 с.

6. Маринова Е.В. Иноязычные слова в русской речи конца XX – начала XXI в.: проблемы освоения и функционирования / Автореферат диссертации доктора филологических наук. Москва, 2008, 44 с.

7. Попов Р.Н., Валькова Д.П., Маловицкий Л.Я. и др. Современный русский язык. Москва: Просвещение, 1978, 463 с.

8. Современный русский язык: Лексика и фразеология. Фонетика и орфоэпия. Графика и орфография. Словообразование. Морфология. Синтаксис: Учебник для вузов. / Под редакцией Д.Э. Розенталя. Изд. 4-е. Москва: Высшая школа, 1984, 735 с.

9. Филин Ф.П. Словарь русских народных говоров. Выпуск 1. (А). Москва-Ленинград: Наука, 1965, 306 с.

SECTION OF MATHEMATICS, PHYSICS, AND INFORMATICS

INTERNET OF THINGS (IOT): APPLICATIONS AND PERSPECTIVES IN MODERN TECHNOLOGIES

Aliyeva G.
Sheki Branch of ADPU, head teacher
https://orcid.org/0000-0002-6613-8227
DOI: 10.5281/zenodo.18656104

Abstract

The Internet of Things (IoT) has emerged as one of the most influential technological paradigms shaping contemporary digital transformation processes across industries and societies. By enabling physical objects equipped with sensors, software, and network connectivity to collect, exchange, and analyze data autonomously, IoT bridges the gap between the physical and digital worlds. This article aims to provide a comprehensive and systematic analysis of the IoT concept, focusing on its architectural foundations, major application domains, and the opportunities it creates for efficiency, automation, and intelligent decision-making.

The study adopts a qualitative research approach based on an extensive review of peer-reviewed journal articles and conference proceedings published in recent years. Particular attention is given to IoT applications in healthcare, industrial automation, smart agriculture, and smart city infrastructures, where real-time data processing and connectivity play a critical role. In addition, the paper examines key challenges associated with IoT adoption, including cybersecurity vulnerabilities, data privacy concerns, lack of standardization, and ethical considerations.

The findings indicate that while IoT technologies significantly enhance operational performance and resource optimization, their sustainable and large-scale implementation depends on the development of robust security frameworks, regulatory policies, and interoperable system architectures. The article concludes by highlighting future research directions, emphasizing the integration of IoT with artificial intelligence, big data analytics, and edge computing as essential components for the next generation of smart systems.

Keywords: Internet of Things, IoT, digital transformation, smart systems, Industry 4.0.

1. Introduction: Rapid advancements in information and communication technologies (ICT) have fundamentally reshaped the structure of modern societies, economies, and governance systems. In this context, the Internet of Things (IoT) has emerged as a key technological paradigm enabling the digital transformation of physical environments through interconnected smart devices. IoT refers to a networked ecosystem in which physical objects embedded with sensors, software, and communication capabilities are able to collect, transmit, and process data with minimal human intervention (Atzori et al., 2010).

Unlike traditional internet systems that primarily facilitate human-to-human communication, IoT expands connectivity to include machine-to-machine (M2M) and machine-to-human interactions. This shift enables real-time monitoring, automation, and intelligent control across diverse domains such as healthcare, manufacturing, transportation, agriculture, and urban infrastructure. The proliferation of low-cost sensors, high-speed wireless networks, cloud computing platforms, and data analytics tools has significantly accelerated IoT adoption worldwide (Gubbi et al., 2013).

From a strategic perspective, IoT is considered a foundational technology for emerging concepts such as smart cities, Industry 4.0, and cyber-physical systems. Governments and organizations increasingly invest in IoT-based solutions to improve operational efficiency, sustainability, and service quality. However, alongside these opportunities, IoT also introduces complex challenges related to security, privacy, data governance, and ethical responsibility. Therefore, a comprehensive academic examination of IoT systems, applications, and limitations is essential for understanding their long-term societal impact.

This article aims to contribute to the existing body of knowledge by providing an in-depth analysis of IoT technologies, reviewing relevant literature, examining key application areas, and discussing critical challenges and future research directions.

2. Literature Review

The academic discourse on the Internet of Things has expanded rapidly over the past two decades. The term IoT was initially introduced by Kevin Ashton in 1999 to describe the use of RFID technology for tracking objects within supply chains (Ashton, 2009). Early research primarily focused on object identification and connectivity; however, subsequent studies have broadened the scope to include data analytics, system architecture, and intelligent decision-making.

Atzori et al. (2010) presented one of the most influential surveys in IoT research, categorizing IoT systems into three main paradigms: internet-oriented, things-oriented, and semantic-oriented approaches. This classification highlighted the multidisciplinary nature of IoT, combining networking technologies, embedded systems, and information processing. Gubbi et al. (2013) further advanced IoT architecture by proposing a cloud-centric model that emphasizes scalability, flexibility, and real-time data analytics.

More recent literature explores the convergence of IoT with artificial intelligence (AI), big data, and edge computing. These integrations enable predictive analytics, autonomous decision-making, and reduced latency

in mission-critical applications (Zanella et al., 2014). In industrial contexts, IoT is closely linked to the Industry 4.0 framework, supporting smart manufacturing and predictive maintenance (Lu, 2017).

Despite its technological potential, numerous studies emphasize persistent challenges related to cybersecurity, privacy protection, interoperability, and regulatory compliance. Weber (2010) argues that inadequate legal and technical safeguards may undermine public trust in IoT systems. Consequently, current research increasingly focuses on developing secure, ethical, and sustainable IoT ecosystems.

The concept of IoT was first introduced by Kevin Ashton in 1999 in the context of supply chain management and RFID technologies (Ashton, 2009). Since then, numerous studies have explored its architecture, applications, and challenges. Atzori et al. (2010) classified IoT research into three main perspectives: internet-oriented, things-oriented, and semantic-oriented approaches.

Gubbi et al. (2013) proposed a cloud-centric IoT architecture emphasizing scalability and data analytics. Recent studies focus on integrating IoT with artificial intelligence (AI) and big data analytics to enhance decision-making capabilities (Zanella et al., 2014). However, security and privacy concerns remain among the most discussed limitations in the literature (Weber, 2010).

3. Methodology

This study employs a qualitative research methodology based on systematic literature analysis. Peer-reviewed journal articles, conference papers, and authoritative reports published between 2010 and 2024 were examined. The selection criteria included relevance to IoT architecture, application areas, and security challenges. Content analysis was used to synthesize findings and identify prevailing trends and research gaps in IoT studies.

4. Results and Analysis

Analysis of the reviewed literature indicates that IoT systems generally consist of four core components: sensing layer, network layer, data processing layer, and application layer (Gubbi et al., 2013). These components collectively enable real-time data acquisition and intelligent system behavior.

IoT applications demonstrate significant benefits across multiple sectors. In healthcare, wearable IoT devices support continuous patient monitoring and early diagnosis (Islam et al., 2015). In industrial contexts, IoT facilitates predictive maintenance and process optimization, contributing to the Industry 4.0 paradigm (Lu, 2017). Smart agriculture applications enhance resource efficiency through data-driven irrigation and crop monitoring systems.

Despite these advantages, security vulnerabilities such as unauthorized access, data breaches, and lack of standardization pose serious risks. The analysis confirms that inadequate security frameworks can undermine user trust and limit large-scale adoption (Weber, 2010).

5. Discussion

The findings suggest that IoT has the potential to significantly enhance operational efficiency and decision-making processes. However, the rapid expansion of IoT ecosystems necessitates robust regulatory frameworks and advanced security mechanisms. Integrating IoT with AI and edge computing may address latency and data privacy issues, while standardization efforts are essential for interoperability.

From an academic perspective, future research should focus on scalable security solutions, ethical implications, and sustainable IoT development. Interdisciplinary approaches combining engineering, data science, and social sciences will be critical for addressing complex IoT challenges.

6. Conclusion

The Internet of Things represents a pivotal technological innovation with far-reaching implications for modern society. While IoT offers substantial benefits in automation, efficiency, and data-driven decision-making, its successful implementation depends on addressing security, privacy, and standardization challenges. Continued research and international collaboration will play a vital role in unlocking the full potential of IoT technologies.

References

1. Ashton, K. (2009). That ‘Internet of Things’ Thing. *RFID Journal*.

2. Atzori, L., Iera, A., & Morabito, G. (2010). The Internet of Things: A survey. *Computer Networks*, 54(15), 2787–2805.

3. Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M. (2013). Internet of Things (IoT): A vision, architectural elements, and future directions. *Future Generation Computer Systems*, 29(7), 1645–1660.

4. Islam, S. M. R., Kwak, D., Kabir, M. H., Hossain, M., & Kwak, K. S. (2015). The Internet of Things for health care: A comprehensive survey. *IEEE Access*, 3, 678–708.

5. Lu, Y. (2017). Industry 4.0: A survey on technologies, applications and open research issues. *Journal of Industrial Information Integration*, 6, 1–10.

6. Weber, R. H. (2010). Internet of Things – New security and privacy challenges. *Computer Law & Security Review*, 26(1), 23–30.

7. Zanella, A., Bui, N., Castellani, A., Vangelista, L., & Zorzi, M. (2014). Internet of Things for smart cities. *IEEE Internet of Things Journal*, 1(1), 22–32.

КОРРЕКТНОСТЬ ЗАДАЧИ ОПТИМАЛЬНОГО УПРАВЛЕНИЯ ДЛЯ КВАЗИЛИНЕЙНОГО НАГРУЖЕННОГО ГИПЕРБОЛИЧЕСКОГО УРАВНЕНИЯ

Гашимов С.А.
кандидат физико-математических наук, доцент,
Бакинский Государственный Университет, г. Баку

CORRECTNESS OF THE OPTIMAL CONTROL PROBLEM FOR A QUASILINEAR LOADED HYPERBOLIC EQUATION

Hashimov S.
Candidate of Physical and Mathematical Sciences, Associate Professor,
Baku State University, Baku
DOI: 10.5281/zenodo.18656116

Аннотация

В данной работе рассматривается задача оптимального управления для нагруженного квазилинейного гиперболического уравнения. Исследованы вопросы корректности постановки задачи, доказана теорема единственности и существования.

Abstract

In this paper, we consider the problem of optimal control for loaded quasilinear hyperbolic equations. The issues of the correctness of the problem statement are investigated, the theorem of uniqueness and existence is proved.

Ключевые слова: оптимальное управление, нагруженное дифференциальное уравнение, гиперболическое уравнение.

Keywords: optimal control, loaded differential equation, hyperbolic equation.

Введение

Задачи оптимального управления, системами описываемыми дифференциальными уравнениями в частных производных встречаются в различных приложениях. Среди этих задач особый интерес представляют задачи, в которых управления входят в коэффициенты уравнений для состояний. При изучении таких задач оптимального управления возникает ряд трудностей, связанных с их нелинейностью и некорректностью [1-6].

Регулирование уровня грунтовых вод и долгосрочное прогнозирование, определение влажности почвы, тепломассопереноса с конечной скоростью и т.д. повысили интерес к исследованию нагруженных уравнений [7,8] и задач оптимального управления процессами, описываемыми нагруженными уравнениями частными производными. Задачи оптимального управления линейными нагруженными дифференциальными уравнений с частными производными изучалось в работах [9,10]. Однако, задачи оптимального управления процессами, описываемыми нагруженными уравнениями частными производными с управлениями в коэффициентах, исследованы существенно слабее [11]. Исследуемая проблема различается в связи с постановкой, а следовательно и полученными результатами. В данной работе рассматривается задача оптимального управления состояние которых описывается квазилинейным нагруженным уравнением гиперболического типа. Изучены вопросы корректности рассмотренной задачи, доказаны теоремы единственности и существования.

Постановка задачи

Предположим, что $D = [0, l]$, $\Omega = D \times [0, T\,]$, $l, T > 0$ -заданные числа. Пусть

$$V = \{v: v = (v_0, v_1, \dots, v_i, \dots) \in l_2, \|v\|_{l_2} \le R\},$$

где $R > 0$ -заданные число.

Далее, пусть требуется минимизировать функционал

$$J(v) = \int_0^T f_0\big(t, u(0,t), u(l,t)\big)dt + \alpha\|v - \omega\|_{l_2}^2 \quad (1)$$

на множестве V при условиях

$$\frac{\partial^2 u}{\partial t^2} - \frac{\partial^2 u}{\partial x^2} = f(x,t,u,q,v), (x,t) \in \Omega, \quad (2)$$

$$u(x,0) = \varphi_0(x), \frac{\partial u}{\partial t}\Big|_{t=0} = \varphi_1(x), x \in D, \quad (3)$$

$$\frac{\partial u}{\partial x}\Big|_{x=0} = g_0(t), \frac{\partial u}{\partial x}\Big|_{x=l} = g_1(t), t \in [0,T] \quad (4)$$

где $\alpha \ge 0$ заданное число, $\omega = (\omega_0, \omega_1, \dots, \omega_i, \dots) \in l_2$ –заданные элемент, $f_0(t,z,w)$ –заданная функция. Функция $f_0(t,z,w)$ удовлетворяет условию Каратеодори: при каждом $(z,w) \in E_1 x E_1$ измеримая по $t \in [0,T]$ и при почти всех $t \in [0,T]$ непрерывна по $(z,w) \in E_1 x E_1$, имеет непрерывные производные по z и w при $t \in [0,T]$ также удовлетворяющие условию Каратеодори, причем $f_0(\cdot,z,w) \in L_1[0,T]$; $f(x,t,u,q,v)$ заданная функция, удовлетворяющая условию Каратеодори: при каждом $(u,q,v) \in E_1 \times E_\rho \times l_2$ измеримая по $(x,t) \in \Omega$ и при почти всех $(x,t) \in \Omega$ непрерывна по $(u,q,v) \in E_1 \times E_\rho \times l_2$, имеет непрерывные и ограниченные производные по u, q, также удовлетворяющие условию Каратеодори, причем $f(\cdot,\cdot,u,q,v) \in L_2(\Omega)$ для $\forall u(x,t) \in L_2(\Omega)$, $q(t) = \big(q_1(t), q_2(t), \dots, q_\rho(t)\big), q_k(t) = u(\xi_k, t)$, $k = \overline{1,\rho}$ –есть значения функции $u(x,t)$ взятые для фиксированных точек $\xi_k \in (0,l)$.

Кроме того, $\varphi_0(x) \in W_2^1(D)$, $\varphi_1(x) \in L_2(D), g_0(t), g_1(t) \in L_2(0,T)$. $f_0(t,z,w) \ge c_1 > -\infty, c_1 = const, \forall (z,w) \in E_1 x E_1, \forall t \in [0,\mathrm{T}], v \in V$.

Задача определения функции $u = u(x,t)$ при условиях (2) -(4) при заданном $\forall v \in V$ назовем редуцированной задачей.

Определение. Под решением редуцированной задачи (2) -(4) будем понимать функцию $u = u(x,t)$ из пространства $W_2^1(\Omega)$, равную $\varphi_0(x)$ при $t = 0$ и удовлетворяющую интегральному тождеству

$$\int_0^T \int_0^l \Big[-\frac{\partial u}{\partial t}\frac{\partial \eta}{\partial t} + \frac{\partial u}{\partial x}\frac{\partial \eta}{\partial x} - f(x,t,u,q,v)\eta\Big]dxdt = \int_0^l \varphi_1(x)\eta(x,0)dx + \int_0^T [g_1(t)\eta(l,t) - g_0(t)\eta(0,t)]dt. \quad (5)$$

для $\forall \eta = \eta(x,t) \in W_2^1(\Omega)$ с условием $\eta(x,T) = 0$.

Решение редуцированной задачи неявно зависит от управления $v \in V$, поэтому будем пользоваться еще обозначением $u = u(x,t;v)$. Редуцированная задача является начально-краевой задачей для квазилинейного уравнения гиперболического типа.

Целью настоящей работы является исследование оптимальной задачи (1)-(4). Поэтому в дальнейшем, будем предполагать, что при каждом $v \in V$ решение редуцированной задачи существует и единственное.

Согласно теоремам вложения [13] $W_2^1(\Omega) \subset L_2(0,T; C[0,l])$. Поэтому $u \in L_2(0,T; C[0,l])$.

Корректность постановки задачи

Теперь докажем, существование и единственность решения задачи (1) -(4).

Теорема. Существует плотное подмножество K пространства l_2 такое, что для любого $\omega \in K$ задача минимизации функционала (1) на множестве V при $\alpha > 0$ имеет единственное решение.

Доказательство. Сперва докажем, что функционал

$I(v) = \int_0^T f_0\big(t, u(0,t), u(l,t)\big)dt$ непрерывен на V.

Пусть $\Delta v = (\Delta v_0, \Delta v_1, \dots, \Delta v_i, \dots) \in l_2$ –приращения управления на элементе $v \in V$, такое, что $v + \Delta v \in V$. Обозначим $\Delta u(x,t) = u(x,t;v+\Delta v) - u(x,t;v)$, $\Delta q = \big(\Delta q_1, \Delta q_2, \dots, \Delta q_\rho\big), \Delta q_k = \Delta u(\xi_k, t)$, $k = \overline{1,\rho}$.

Функция $\Delta u(x,t)$ является решением следующей задачи.

$$\frac{\partial^2 \Delta u}{\partial t^2} - \frac{\partial^2 \Delta u}{\partial x^2} = \Delta f(x,t,u,q,v), (x,t) \in \Omega, \quad (6)$$

$$\Delta u(x,0) = 0, \frac{\partial \Delta u}{\partial t}\Big|_{t=0} = 0, x \in D, \quad (7)$$

$$\frac{\partial \Delta u}{\partial x}\Big|_{x=0} = 0, \frac{\partial \Delta u}{\partial x}\Big|_{x=l} = 0, t \in [0,T] \quad (8)$$

где $\Delta f(x,t,u,q,v) = f(x,t,u+\Delta u, q+\Delta q, v+\Delta v) - f(x,t,u,q,v)$

Ясно, что функция $\Delta u(x,t)$ равна нулю при $t=0$ и удовлетворяет интегральному тождеству

$$\int_0^T\int_0^l [-\frac{\partial \Delta u}{\partial t}\frac{\partial \eta}{\partial t}+\frac{\partial \Delta u}{\partial x}\frac{\partial \eta}{\partial x}-\Delta f\eta]dxdt=0 \quad (9)$$

для $\forall \eta=\eta(x,t)\in W_2^1(\Omega)$ с условием $\eta(x,T)=0$. Здесь $\Delta f=\Delta f(x,t,u,q,v), \Delta u=\Delta u(x,t;v)$.

В силу сделанных предположений из тождества (9) следует, что

$$\int_\Omega \left[-\frac{\partial \Delta u}{\partial t}\frac{\partial \eta}{\partial t}+\frac{\partial \Delta u}{\partial x}\frac{\partial \eta}{\partial x}-\frac{\partial f(x,t,u+\theta\Delta u,q+\Delta q,v+\Delta v)}{\partial u}\Delta u\eta\right.$$
$$\left.-\left(\frac{\partial f(x,t,u,q+\gamma_1\Delta q,v+\Delta v)}{\partial q_1}\Delta q_1+\cdots+\frac{\partial f(x,t,u,q+\gamma_\rho\Delta q,v+\Delta v)}{\partial q_\rho}\Delta q_\rho\right)\eta\right]dxdt$$
$$=\int_\Omega [f(x,t,u,q,v+\Delta v)-f(x,t,u,q,v)]dxdt \quad (10)$$

Здесь $\theta,\gamma_i\in(0,1)$, $i=\overline{1,\rho}$ -некоторые числа.

Следуя методике работы [12, стр. 209- 213] нетрудно доказать, что для функции $\Delta u(x,t)$ имеет место оценка.

$$\|\Delta u\|_{W_2^1(\Omega)}\le c_2\left[\int_\Omega [f(x,t,u,q,v+\Delta v)-f(x,t,u,q,v)]^2dxdt\right]^{\frac{1}{2}} \quad (11)$$

где $c_2\ge 0$ – некоторая постоянная. В силу принятых выше предположений правая часть неравенства (11) стремится к нулю при $\|\Delta v\|_{l_2}\to 0$ и поэтому $\|\Delta u\|_{W_2^1(\Omega)}\to 0$. Отсюда и из теоремы о следах получим, что

$$\|\Delta u\|_{L_2(\Omega)}\to 0, \|\Delta u\|_{L_2(S)}\to 0 \text{ при } \|\Delta v\|_{l_2}\to 0.$$

Для приращения функционала $I(v)$ справедливо выражение.

$$I(v+\Delta v)-I(v)=\int_0^T\left[f_0\big(t,u(0,t)+\Delta u(0,t),u(l,t)+\Delta u(l,t)\big)--f_0\big(t,u(0,t),u(l,t)\big)\right]dt.$$

Отсюда и из того, что функция $f_0(t,z,w)$ непрерывна по z и w, заключаем, что оператор $f_0(t,z,w)$ действует из $W_2^1(S)$ в $L_1(S)$ и $\|\Delta u\|_{L_2(S)}\to 0$ при $\|\Delta v\|_{l_2}\to 0$, откуда следует непрерывность функционала $I(v)$.

В силу того, что $f_0(t,z,w)\ge c_1>-\infty, \forall z,w\in E_1, \forall t\in[0,T]$ функционал $I(v)$ снизу ограничен и является непрерывным на V. Кроме того l_2 –равномерно выпуклое и рефлексивно банахово пространство [14].

Тогда по теореме из работы [15], следует существование плотного подмножества K в пространстве l_2, такого, что для любого ω из этого множества при $\alpha>0$ задача (1)-(4) имеет единственное решение. Теорема доказана.

Список литературы

1. Искендеров А.Д., Тагиев Р.К. Задачи оптимизации с управлениями в коэффициентах параболического уравнения. // Дифференц. уравнения, -1983, - Т.19, -№ 8, -с.1324-1334.

2. Тагиев Р.К. Задача оптимального управления для квазилинейного параболического уравнения с управлениями в коэффициентах и с фазовыми ограничениями // Дифференц. уравнения, -2013, -Т.49, -№ 3, -с.380-392.

3. Тагиев Р.К., Гашимов С.А. Задача оптимального управления в коэффициентах параболического уравнения при наличии фазовых ограничений. // Автоматика и телемеханика, -2015, -№ 8, -с.27-45.

4. Tagiev R.K, Hashimov S.A. The optimal control problem for the coefficients of a parabolic equation under phase constraints. ISSN 0005-1179 Automation and Remote Control, -2015, -Vol 76, -№ 8, -pp 1347-1360.

5. Rafiq K. Tagıyev, Sadiq A. Hashimov On optimal control of the coefficients of a parabolic equation involing phase constraints Proceedings of IMM of NAS of Azerbaijan, -2013, -Vol. -XXXVIII (XLVI), -pages131-146.

6. M.A. Musayeva, S.A. Hashimov Identification Problem For Nonlinear Schrodinger Type Equation. “TWMS Journal of Pure and Applied Mathematics”-V.14, N.2, 2023. pp.162-177.

7. Искандеров А.Д., О смешанной задаче для нагруженных квазилинейных уравнений гиперболического типа. // Доклад АН СССР, -1971, -т.199, -№ 6, -с.1237–1239.

8. Нахушев А.М. Нагруженные уравнения и их применение. -Наука, -2012, -231 с.

9. Дженалиев М.Т. Оптимальное управление линейными нагруженными параболическими уравнениями. // Дифференц. уравнения, -1989, -т.25, -№ 4, -с.641–651.

10. Дженалиев М.Т. Краевые задачи и задачи оптимального управления для линейных нагруженных уравнений гиперболического типа. // Дифференц.уравнения, -1992, -т.28, -№ 2, -с.232–241.

11. Гашимов С.А. Об одной задаче оптимального управления для нагруженного параболического управления. Известия Академии Наука Азербайджана, -1998, -т.18, -№ 5, -с.41-45.

12. Ладыженская О.А. Краевые задачи математической физики. -Москва: Наука, -1973, -408 с.

13. Ладыженская О.А., Солонников В.А., Уральцева Н.Н. Линейные и квазилинейные уравнения параболического типа. -Москва.: Наука, -1967, -736 с.

14. Иосида К. Функциональный анализ. -Москва: Мир, -1967, -624 с.

15. Goebel M. On existence of optimal control. -Math. Nachr., -1979, -volume 93, -pages 67-73.

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